RAILROAD GAZETTE

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Contributions

Resident Ownership of Railroad Stocks.

Pennsylvania Railroad Company,
Philadelphia, June 18, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Referring to the article in your issue of the 15th instant on "Resident Ownership of Railroad Stocks," I beg to say that in a conversation with Mr. Nishino, Traffic Manager of the Sanyo Railway of Japan, he told me that on his railroad a plan is in effect under which the employees of that road (excluding the lowest grades) share in the net earnings to a considerable extent which sometimes at least gives them a bonus by increasing their pay by as much as 30 or 40 per cent.

A. HALE, Supt. Telegraph.

The Creo-Resinate Timber Treatment.

New York, June 12, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

There are practically but three processes in use for the preservation of lumber in this country; however, there is a fourth which is used, I believe, by the Southern Pacific Railroad. The processes referred to are creosoting, vulcanizing, chloride of zinc and chloride of zinc and creosote mixed. Creosote has been used for 50 years and upwards, and has the best standing to-day as a preservative.

Chloride of zinc is very soluble and has a tendency to make the wood brittle. In order to overcome this solubility it is given a treatment of tannin and glue which makes a thin outer coating. If about 5 per cent. of this treatment is chloride of zinc and 95 per cent. water, it must necessarily follow that if the coating of tannin prevents living matter from entering from the outside, it must hold this water on the inside of the timber. This process is more applicable to hemlock or other lean timber, and not adapted to good long leaf yellow pine, which is filled with resin and will resist the 95 per cent. of water used as a carrier to penetrate the wood.

Creosote has a tendency to become dissipated under the action of the elements. A very simple test of this can be made by soaking a piece of creosoted timber in water and then analyzing the water. Being an oil, it has a tendency to soften timber, increase rail cutting and decrease spike-holding quality. Moreover, it is difficult to thoroughly sterilize by present creosoting methods.

Vulcanizing is nothing more or less than a process of thorough sterilization, diffusing the resinous matter throughout the wood, increasing the crushing resistance and producing a very slight amount of antiseptic; not enough, however, to act as a preservative in the ground.

The creo-resinate process (see *Railroad Gazette*, June 1, p. 360) is vulcanized wood subjected to treatment with a mixture of creosote, resin and formaldehyde, making an absolutely insoluble, antiseptic compound which, by the application of heat and pressure, is forced into the wood. The formaldehyde is used to reinforce the antiseptic property of the creosote reduced by the use of resin. The timber is then given a final treatment with lime, producing a resinate of lime, which makes a hard elastic surface. The same test of insolubility as applied to creosote will show no trace of the mixture in the water.

It is a well-known fact that resin will resist water, and therefore any method of preservation using 95 per cent. of water as a carrier to convey the chemical into the wood can not accomplish this result in rich resinous timber; while the creo-resinate process is especially adapted to this character of timber. The penetration is easier with the mixture of resin than with pure creosote, and the reason given by the chemist for this is the affinity between the resin in the mixture and that of the wood.

A. BEVIER.

Some Elements of Modern Shop Arrangement.

New York, June 16, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

While it is quite true that the conditions and principles which should govern the introduction of traveling cranes and compressed air plant, in a railroad shop, are well understood (*Railroad Gazette*, June 15, p. 386), yet the several questions which involve the efficiency of electric motors working under variations of load, the amount of power absorbed by different tools or groups of tools, the permissible minimum ratio between total electrical power to be provided at the central supply station and the total of the rated capacity of the motors to be driven (and a number of kindred and similar questions) are not so well understood by those who have hitherto been principally concerned in the design of railroad shops. New possibilities of improved results and increased operating economies are constantly challenging attention, and the designer of modern railroad shop plants must at least consider the claims of the gas engine and the steam turbine.

The suggestion that new shops may be erected on present transfer table locations is meritorious, especially for locations where new ground is not available. I am inclined to believe that with the modern tendency to concentrate shops and locomotive repairs, the longitudinal type of locomotive repair shop will win more advocates, as time goes on, and the transverse system will be reserved for use at points where but few locomotives are handled. One advantage in the longitudinal system which I have not hitherto seen mentioned, is that each engine need only take track room suitable for its length; whereas, in the transverse system each engine must monopolize a pit or stall, and the stall tracks must necessarily be long enough for the longest engine in use at the time the shop was designed, with preferably an excess of length to provide for possible increases. One defect in the longitudinal system is that the desire to keep down the span of the traveling cranes has resulted in leaving the shop too narrow for convenient working, and for the storage of materials.

The use of long buildings, as in recent English practice, may easily be justified, but the advantage of uniform span and uniform roof trusses should not be allowed to prevent the use of such a particlar span for each building as best promotes the economical handling of the work in that building.

The arrangement of the new Oelwein shops of the Chicago Great Western challenges attention from the fact that unusual duty is imposed on the transfer table, which seems to be the key to the situation; and the question has been raised whether the work of the different departments may not at times be delayed waiting for transfer table service.

R. H. S.

The Master Car Builders' Convention.

The thirty-fourth annual meeting of the Master Car Builders' Association was opened Monday morning, June 18, at Saratoga, N. Y., under most favorable conditions. The weather was perfect and the attendance large. The meeting was called to order by the President, Mr. C. A. Schroyer, of the Chicago & Northwestern. Mr. John Foley, President of the village, made an address of welcome. In the President's annual address, Mr. Schroyer said in part:

EXTRACTS FROM THE PRESIDENT'S ADDRESS.

The subject of basis of representation in our Association has been called to my attention several times by representative members of large interests, who were of the opinion that the basis should be changed from 1,000 cars with eight-wheeled trucks entitled to one vote, to a tonnage capacity, which would very materially increase the power of some of the lines over what is now represented. In this connection, I wish to call your attention to what I consider a mistaken idea on the part of some of the companies now enjoying the privileges and advantages derived from membership in this association, in the withdrawal of their representative members and the appointment of active members, thereby saving a small amount in fees paid and at the same time enjoying fully the benefits and advantages of the association.

We have, to-day, a representation here in cars of 1,348,131, and there was on the first day of January last, 1,191,189 cars equipped with automatic couplers, leaving a balance yet to be so equipped of 156,942 cars, and I am glad to say that practically this entire number has been fitted up since that time; where it has not been done, it is due to the fact that the cars were, or are, out of the possession of the owners, but the utmost endeavors are now being exercised on the part of all railroad companies and car owners to have their cars properly equipped before expiration of the limit of time designated in the national law requiring this work to be done.

I also wish to call your special attention at this time to a matter of the utmost importance, in so far as the question of safety in the operation of these coupling and uncoupling devices is concerned, and for your information I will quote two paragraphs from the 13th Annual Report of the Interstate Commerce Commission (1899), issued under date of January 15, 1900, reading as follows, viz.:

"A very large number of cars have been found where the appliances for operating the couplers, especially the unlocking machinery, were so out of order and unworkable that, though the cars were actually provided with automatic couplers, they could not be uncoupled without the trainmen going between the cars, and in some cases being obliged to resort to mechanical assistance in order to get the cars apart. Such a coupler is not automatic in the sense contemplated by the law. Its use subjects the men to risks and dangers which are obviously greater than those which existed when the old link and pin coupler was employed.

"In view of the conditions disclosed by the inspector's reports, it seems vital that the uncoupling attachments shall be kept in perfect working order, and there should also be general uniformity in the construction, application and operation of such attachments. In a hazardous employment the man does his work with greatest safety who has least need to think how the act is to be done. If he does it always in the same manner he does it mechanically and unerringly. The uncoupling attachments used with automatic couplers do not all operate alike, and some of them are characterized as confusing by the trainmen. The Master Car Builders' Association, which has done so much good in establishing standards of uniformity, appears to have fully considered this matter. In 1897 and 1898 that association recommended a practice as to the application of uncoupling levers and attachments which we suggest should be followed. The details of such practice, with some additions to show the operating positions of uncoupling levers when used with various kinds of Master Car Builders' couplers, are shown by diagrams in the same appendix. * * * It is important for the safe performance of his work, much of which is done in the darkness of the night and often in storms, that the trainman should be able to determine by the position of the lever whether the coupler is in the locked or unlocked position. He can do this with uniform construction and application of the uncoupling levers, if the attachments are kept in repair."

From this you will note the importance that is attached by our national legislature to the questions of proper condition and the desirability of the adoption of uniform coupling and uncoupling apparatus for our freight car equipment. The adoption of such apparatus was consummated last year, but we observe with regret that there is a great lack of uniformity and failure on the part of many companies to comply with the recommended standards of this association in this respect. It has been suggested that the M. C. B. Association adopt rules permitting the rejection of a car at interchange points that is not properly equipped with unlocking apparatus and safety devices as recommended by the standards of this Association, and I am of the opinion that the same recommendation would apply equally as well to all the standards adopted by this body.

The Secretary reported that the membership during the past year had increased from 458 to 463 members; last year 1,348,121 cars were represented in the Association, and now 1,356,861 cars are represented. The receipts during the year were $8,593, and the disbursements were $7,871.66. The Treasurer reported a balance on hand of $9,836.22, while last year the balance was $8,893.12. The annual dues were not changed and will remain $4 per vote per year.

STANDARDS AND RECOMMENDED PRACTICE.

The report of the committee on Standards and Recommended Practice was presented by Mr. A. M. Waitt, Chairman of the Committee. After presenting the report, Mr. Waitt said: In addition to the report the Committee will state that it received a communication from the Secretary of the Interstate Commerce Commission, which is as follows: "I take the liberty of calling your attention to the Thirteenth Annual Report of the Interstate Commerce Commission * * * and particularly to pages 50, 51 and 261, in the hope that the Master Car Builders will take decisive action at their coming convention, both regarding uniformity in unlocking attachments and also the necessity of keeping both these and all safety appliances in perfect order. * * * When a rule is established and fixed that no car will be received from a connecting road unless it conforms to your rules in this respect, a trouble which now threatens to become most serious will * * * be satisfactorily quieted." Quite recently many of the members of this Association received the supplementary report of the Interstate Commerce Commission, which is quite a thick volume, containing the reports of their inspectors, showing a lamentable condition of uncoupling attachments on many of the cars, and in connection with this matter it seems to me to be important enough to refer it to the Committee on Arbitration, requesting that Committee to bring in recommendations in their report to-morrow for rules which will cover the subject of uncoupling attachments, making it of equal importance with missing parts on cars which we are trying to maintain. I move that the matter be referred to the Committee on Arbitration and that they be requested to bring in a rule to cover the subject. Carried.

It was decided that Recommendations Nos. 1, 2 and 5 of the Committee on Standards be submitted to letter ballot for adoption, and that recommendations 3 and 4 of the Committee be made special topics for discussion, as requested. The third paragraph of the report of the Committee, referring to screw threads, bolt heads and nuts, was then taken up for discussion.

Mr. A. M. Waitt (New York Central)—In order that the members may clearly understand what the recommendations were, having been made last year, I will briefly state the substance of the report of the committee on square bolt heads. The Committee says: "It will be seen from Prof. Hatt's report that there is evidently ample strength in the smaller heads, and that as far as the question of strength is concerned, there is no

reason why a smaller head than the M. C. B. or M. M. standard can not be used, and we recommend the following standard for square head bolts: The short diameter of heads shall be one and one-half times the diameter of the bolt and the thickness of head shall be one-half the short diameter of the head. As regards square nuts, we recommend that no change in the present standard be made, as it is believed that there is no demand for it, and the replies from the different roads show that there is no difficulty in getting them of M. C. B. standard. While it is true that there may be some disadvantages in having bolt heads and nuts of different size on account of difficulty in using wrenches, it is believed that wrenches can easily be made in 'S' form, fitted at one end for the nut and at the opposite end for the bolt head. It is also believed that it is not safe to make the short diameter of the nuts any less, as this would result in greater liability of the nut splitting."

The Committee recommended last year that this change should be made, and the Committee supposed it would be submitted to letter ballot for adoption as a standard; that these heads would be used in place of the old style of bolt head. Through some oversight it was not submitted to letter ballot, and the Committee on Standards thought the matter should be taken up again and proper action taken, so as not to lose sight of the Committee's work. The Committee on Standards would suggest that the recommendation of last year's Committee be submitted to letter ballot for adoption as a standard, and I make that as a motion. Carried.

Mr. G. W. Rhodes (Burlington & Missouri River)—I desire to suggest that this matter be taken up with the American Society of Civil Engineers and others, and that it also be taken up with the manufacturers. I think if our Association will adopt it as a standard, and also the Master Mechanics' Association, as well as the American Society of Civil Engineers and the American Society of Mechanical Engineers, the manufacturers will adopt it. I make a motion that the Secretary take the question up with the various societies and manufacturers. Carried. Recommendation 4 was next discussed.

Mr. A. M. Waitt—The Recommendation 4 of the Committee that was adopted as standard for specifications of steel axles for last year is found on page 433 of the Proceedings, which gives the limits of carbon, manganese, silicon, phosphorus and sulphur. And on page 435 it allows carbon as high as .50 per cent., and some members of the Association, in commenting on the Standards, consider that for ordinary freight car service, where a car gets no especial supervision, it was unwise to allow for that class of axles the percentage of carbon to be so high, where it might not be objectionable on a passenger car, tender or on the driving axles of a locomotive; because such axles would have constant supervision and more apt to have wise attention in cooling off heated axles. The freight car for which this is intended, the percentage is high enough, so that it seemed to be an open question if the sudden cooling of the axle when at a dull red heat might not check the collar and cause it to break off sometime when it might be damaged. The Committee thought it would be wise to call the attention of the Association to this point for such action as may be considered wise. The point is whether the percentage should be allowed to go beyond .40 per cent., and then to reduce the minimum percentage correspondingly down to .25. In order to bring the matter up for discussion, not to express an opinion, I would move that the question of reducing the limits from 0.35 to 0.50 down to 0.25 to 0.40 be submitted to letter ballot.

Several members opposed the change. The motion was then withdrawn with the understanding that the question would be the subject of special report at the next meeting.

TOPICAL DISCUSSION.

When pressed steel trucks are broken on a foreign road, should not repairs be made by the manufacturer or the owners, in place of repairs being attempted by the road on which the car may be?

Mr. B. Haskell (Pere Marquette)—Personally, I have had no experience with broken pressed steel trucks. I have had experience in three cases with trucks that were distorted. In two cases these were easily repaired in the boiler shop. Of course, most of those using these steel trucks can not maintain dies and presses for repairing them. It would be out of the question with our system, and in that case it seems to me that the best parties to repair them would be the manufacturers, as they have the molds and they are much easier repaired in the mold and much more accurately than can be done by hand with a flange hammer. I think the majority of the roads operating steel trucks would prefer to make these repairs themselves if they can not be made by the manufacturers. I know that such is the case in our company.

Mr. R. H. Johnson (St. Louis Southwestern)—It will be necessary for each company to make its own repairs, from the fact that it may be expected that the metal truck will be the ruling truck in the future, and the sooner the roads are prepared to make the repairs to these cars, the more economical the repairs can be made and the cars returned into service.

Mr. W. G. Gorrall (Philadelphia & Reading)—I agree that the proper way to handle steel trucks is for each company to repair its own. On our road we have returned a number of our trucks to the manufacturers for repairs and it was an expensive operation.

Mr. G. W. Rhodes—Not only should the railroad companies be prepared to do this work themselves, but the manufacturers will be wise if they construct them in such way that the railroads can repair them. In the case of the railroads in the West, with their large territory, it is a serious disadvantage to the movement of the cars if they are laid aside because you have not the facilities to repair them. It is a serious thing that the manufacturers have so far overlooked this very important feature.

Mr. A. M. Waitt—We are still carrying out the same principle we did when I went to the New York Central Road a year ago. Once a month, or once in two months, as the case may be, whatever accumulations there may be of trucks badly out of shape or wrecked, are sent to the manufacturers and they repair and return them. The time is coming when simplicity in these special forms of construction will be given more prominence. If they can get the trucks up so that aside from the trimmings, they will have only three or four main parts to them, we can carry the side pieces and transoms, thus enabling us to cut the rivets from a bent one, put in a new one, rivet it up and send the car on its way. The railroads themselves must do repairs of that sort. We have held off from doing this work largely because the repair shops have been wood-working shops, but the time seems to be coming when there will be less difference between the car shop and boiler shop.

Mr. J. Hodge (Atchison, Topeka & Santa Fe)—We have had more or less experience in repairing metal cars. We have found no difficulty in the undertaking and can repair the cars conveniently and at a great deal less expense than if we send the cars to the manufacturers. When we have found a truck so badly broken it would not pay to repair it, we have destroyed it and paid for it; but as a general thing we have found no difficulty in repairing metal trucks to any extent whatever. The process is more or less complicated and requires a good deal of first-class attention but we have always been able to repair them in a satisfactory manner.

How soon after a new car is built should it be reweighed to modify the original stencil weight; at what intervals should it be reweighed thereafter, and what should be the minimum variation from the previous stencil weight for which change should be made?

Mr. F. A. Delano (Chicago, Burlington & Quincy)—The rule on many of our principal trunk lines is to reweigh all cars once every year and in the summer months. In most cases the rule is a dead letter and even if there is an honest effort to accomplish it, so many of the cars can not be reached, that the reweighing is not done. My observation is that the *shrinkage* in weight of ordinary wooden cars is as great as 1,500 lbs. in the first few summer months after they are built, and that if they are then reweighed, the weight can be trusted for any reasonable time, say even three years, or until the car undergoes general repairs. The weighing and inspection bureaus of the country bear testimony to the loss in revenue due to inaccurate and scant weights. No general officer can feel satisfied on this score on the ground that his own company has strict rules as to reweighing equipment as a very large share of any road's business is handled in foreign equipment. Furthermore, there is evidence that some car owners and even railroad companies are intentionally cutting rates by marking the light weight of their cars from 1,000 to 2,000 lbs. over the actual light weight. I have not a doubt that a large portion of the proper revenue of every railroad company is cut off by inaccuracies in light weight of cars, for which it may not be at all responsible, and I believe this Association should, through its proper committee, consider a proposition for reweighing and restenciling by all railroads, under certain conditions and restrictions, any equipment they may handle; and that a stipulated price be charged for stenciling new weights wherever the variation from existing stencil weights are as much or more than 500 lbs.

The inaccuracy of marked tare weights is a matter of such common knowledge that most large shippers and receivers of freight weigh, for their own benefit, their cars loaded and empty. In many cases this is done by railroad companies free of charge. At the present time the bulk of live stock, grain, coal and many other commodities are weighed into or out of the car, or the cars weighed empty and loaded. I claim that this expense is a useless task, either on the railroad or the business of the country, which might be gradually done away with if the marked tare weights were recognized as honest, accurate and reliable.

Mr. S. P. Bush (Chicago, Milwaukee & St. Paul)—I think that through this Association arrangements might, with perfect propriety, be made by which each road would agree that they would reweigh. I think, as Mr. Delano does on this matter; and I believe that the Association, through a committee, might take up the question with the American Railway Association. I believe the American Railway Association will be the proper body to consider the question of reweighing other than at times when cars are repaired.

Secretary J. W. Taylor—I have a letter on this subject, under date of October 20, 1899, from Mr. C. G. Phillips, Secretary and Treasurer of the Association of American Railway Accounting Officers. The sense of that Association is given by the following from one of its reports:

"1. That the correct light weighing and stenciling of freight cars is a matter of great importance and that it would pay the railroads of this country to go to considerable expense to have it done periodically and systematically by competent men.

"2. That freight cars, both home and foreign, irrespective of where they may be found, be weighed and stenciled once a year. Any car without stenciling should be immediately weighed and stenciled.

"3. That new cars be weighed and stenciled with the actual weight immediately before being put into service and again when the stenciling is more than six months old.

"4. That cars which have received general repairs be weighed and stenciled with the actual weight, before being put back in the service.

"5. That a reasonable and uniform charge be made, on the owning road, for the weighing and stenciling of foreign cars."

Mr. A. M. Waitt—I move that a committee be appointed to report on uniform methods and practices for reweighing cars, both foreign and domestic, including the reporting of same to owners; to include recommendations in regard to the charge for such service. Carried.

THE KNUCKLE SLOT.

President Schroyer—At the meeting of the Executive Committee, held this morning, a member presented a subject for discussion as follows: "Should the link slot in the M. C. B. knuckle be closed?" This is a subject in which we are all interested, and I would like to have Mr. Potter open the discussion.

Mr. G. L. Potter (Pennsylvania Lines)—This matter has been brought up and is being considered quite seriously by a number of roads. The principal question in dispensing with the knuckle slot and pin hole is the difficulty of providing means for handling cars on curves. The subject is one which I do not think could be settled at this meeting, and my recommendation would be to submit it to a committee for report at the next convention.

Mr. W. S. Morris (Chesapeake & Ohio)—The information asked for could probably be given by the Coupler Committee. The Coupler Committee has investigated that matter and desires an expression of opinion from the members of the Association on the subject. It is hardly necessary to have another committee appointed for that specific work.

Mr. R. H. Johnson—We are closing the link slot, but leaving the pin hole open; and with the aid of a short link, where the knuckle will not couple on sharp curves, we drop the link over the head of the two pins and pull the cars out to a point where it will couple.

Mr. J. E. Simons (Montour R. R.)—Some roads around industrial establishments in Pittsburgh have such short curves that it is necessary to use a 3-ft. bar between cars in order to prevent the ends of the end sills from striking together, and we find these links lying alongside the tracks on the curves. The cars are separated and the links put in. It might be well for the Committee to consider this feature particularly.

Mr. W. P. Appleyard (New York, New Haven & Hartford)—There is another feature about the movement of cars without the link and pin. I speak of the places at tidewater and where the cars have to be floated over. The difference in the height of the bridges over which the cars run, makes it necessary to have a shackle to push the cars on the floats, and that is a phase of the question which ought to enter into the design of any appliance to take the place of the link and pin.

Mr. B. Haskell (Pere Marquette)—On our road we have to rely on bars and links in order to get the cars on the floats. I do not think we could operate them successfully without the link and pin. When you put one car on the float, it settles, and it settles more when the next car is put on the float.

Mr. G. W. Rhodes—For the information of the Committee, I would say that there is another feature that comes up in connection with the lines in the West which operate on some of the mountain districts, where there are narrow gage cars and where there will be narrow gage cars for a long time to come, and which operate over the broad gage roads. It is necessary to make some kind of a connection between the narrow gage car and broad gage car, and that is usually done with a bar and coupler pins, and I think when we consider the matter of closing up the hole in the knuckle, we will have to provide some substitute by which we can get a connection between the cars other than with the two knuckles.

Another feature is, there is a little lack of uniformity in our practice. The members have probably heard some members of our Association advocate a coupler which works automatically, which does not couple in a vertical plane. That condition of things now exists on some of the Western roads and I do not know how the lines are going to manage that come up against that condition where the cars come in interchange. The lines that are using this automatic coupler which does not couple in a vertical plane, will try to make the lines that do use the vertical plane coupler accept them; and if we refuse they may possibly try to work up an argument with the road that refuses, that they are laying themselves liable to the Interstate Commerce Law if they refuse a car fitted with an automatic coupler. It seems to me we are not warranted in closing the hole in the knuckle immediately.

President Schroyer—On the Northwestern last year 54 per cent. of the knuckles which were broken, were broken through the upper pin hole above the link slot. The breakage was due to the use of crooked pins which would not go through the two holes when the link was used. We are going to effect a great saving in the breakage of our knuckles when the openings are closed.

Mr. F. A. Delano—I want to call attention to a possible alternative.—Instead of closing the pin hole entirely can we not reduce the opening as much as possible? The size of the largest link used now, I think, is not to exceed 1¼ in. to 1⅜ in., and I should think we could get along with a 1½-in. link slot, whereas a large number of the couplers have a 2 and a 2¼-in. link slot.

Mr. H. S. Hayward (Pennsylvania)—The number of car ferries across rivers at different terminal stations all over the country, not only on the Atlantic Seaboard, but

in the section of the lakes, is very considerable. Attention has been called by some of the members to the fact that it is necessary under certain conditions of the tide to use the link coupler. That is not conforming to the Interstate law as to automatic couplers. I think if the Interstate Commerce Commission becomes aware of the fact that we use a link and pin in our yards and in pushing our cars on floats, they will ask us to devise some way of overcoming that and doing away with the link coupler. I think the question of the adoption of any coupler, not coupled in a vertical plane, not making an automatic coupling with what is known as the M. C. B. coupler, should be taken up seriously by this Association. I can not understand why the Interstate Commerce Commission would permit the use of a coupler that did not conform to the requirements of the standard M. C. B. coupler.

AN M. C. B. INDEX.

Mr. R. H. Soule—In the reports to be presented to the Master Mechanics' Association is one by a committee which was instructed to see what could be done to increase the usefulness of that association. One recommendation is that an index or digest of the Proceedings from the first volume to the last one should be prepared for general use among the membership. I think this is something which would commend itself to the membership of the M. C. B. Association; therefore, in order to discover the sentiment on the question, I move that the Executive Committee be authorized to confer with the Executive Committee of the Master Mechanics' Association to take such action in the matter of a periodical issue of a digest of the proceedings as they may judge to be best for the interests of the M. C. B. Association.

Mr. A. M. Waitt—I offer an amendment that we simply authorize our committee to go ahead and employ the necessary talent for getting a thorough index of our Proceedings at the present time. We can take up the matter of another index later.

Mr. G. W. Rhodes—Our present Proceedings are already indexed. Is this digest which is proposed to be something more complete than that?

Mr. R. H. Soule—My understanding of the recommendation of the Master Mechanics' Committee is that the index or digest should be more complete and thorough than it has ever been before; that it should be issued in a volume by itself and cover the entire transactions with an ample system of cross references; in short, it is to be so convenient and complete that it would be possible for anyone to unearth quickly any of the actions or recommendations of this Association from the beginning of its existence to the present time. There is merit in Mr. Waitt's amendment, but it occurs to me if this indexing was to be done by both Associations at the same time, some money could be saved by having it done in a joint manner.

The amendment of Mr. Waitt was carried, as well as the motion.

BRAKE SHOE TESTS.

Mr. S. P. Bush—The Committee has decided it is not its function to keep on testing indefinitely brake shoes that any inventor may bring out, but it is only its province to test shoes such as railroads are using to some extent. In regular practice we found it is very difficult to distinguish between what was really being used and what was experimental. We concluded it would be well to put off tests for another year, because the expense is considerable and particularly in view of the fact that the brake shoe apparatus has been at Purdue University for a year and every one was notified through the railroad press that they could have brake shoes tested on that machine by paying a nominal sum covering the cost to the University of operating the apparatus.

There are brake shoes being put on the market and used quite extensively because of the wearing qualities which they possess. They wear indefinitely almost. The Committee in its original report showed that brake shoes of that kind did not produce proper frictional resistance; and as a standing committee it hopes another year to present something definite with reference to the shoes which may be produced.

Mr. F. A. Delano—I have referred manufacturers of brake shoes to the Purdue plant before I would talk business with them, and as a result of that action by various roads there have been a number of new designs of shoes tested at Purdue, so that I should like to hear this brief report of the Committee supplemented by data which Professors Goss and Smart of Purdue University could give us. I realize they may be unwilling to mention names but they may be willing to give us some of the details of the test plant and the results obtained, and also on the point of whether the results obtained at different times can be compared; whether they are getting service conditions in their tests.

Prof. W. F. M. Goss—Since the machine was established at Purdue we have made tests of shoes of six or eight different manufacturers. We took this matter up as a piece of expert work, and look upon the results which we obtained as more or less confidential, making a certified report to the persons who pay for the tests. The fee which we charge is a nominal one, considered as a piece of expert work. It is large enough, however, to cut out a good many people from having the tests made. It occurs to me that if encouragement is to be given to such tests being made, there might be a system established by which the Association would do the work and have the responsibility, employing, perhaps, the University for a much smaller amount than we now charge, and the University to report the results to the Association. That would very much cheapen the process of testing. The work would be as well done, but it would not have the aspect of a piece of expert work, coming from the University, for which the manufacturers have had to pay. Aside from the work we have done of the sort indicated, we have been using the machine to a considerable extent in the advancement of several problems of research. We have been attempting to find out a number of things affecting brake shoes, such as the influence of temperature on the co-efficient of friction.

Mr. G. W. Rhodes—I am much interested in what Prof. Goss has said and also in what Mr. Bush said. This question is a very interesting one. I have understood that some railroad companies are more anxious to get brake shoes introduced that wear a long time than shoes which will do efficient braking. When you come to think of it, it is a little singular that we should strive to get a good brake which would retard our high speed trains and then allow a shoe to be used which is not going to do the braking; but diminish the power of the brake. Precisely the same thing comes up with the air-brake work. We get up good air-brakes and determine how to test them and then the railroads of this country mutually agree not to investigate the subject.

Mr. W. S. Morris—I have had twenty applications to test couplers during the last year. Of course, we are not prepared to make any tests. I think the scope of the brake shoe committee should be outlined as regards accepting brake shoes for tests and the same line can be carried out for every other standing committee that is supposed to follow up the testing of these special devices. We can not take every brake shoe that any fellow proposes.

Mr. J. E. Simons—I do not agree with Mr. Bush in regard to the possibility of these tests being prolonged indefinitely. It seems to me the conditions do not change so much but what the Committee could determine the coefficient of friction and the wearing quality of the shoes within a certain time. I would like to see the Committee instructed for a certain period, to receive and test such shoes as may be submitted within that time and select from them what they may determine to be the proper coefficient of friction and wearing quality of the shoes for both freight and passenger cars. The conditions are pretty nearly the same all the time as far as the practical requirements of the shoes are concerned. I would move that the Committee be given instructions to receive such brake shoes as may be presented for tests within the next two years, and to report to this Association just what they consider to be the proper shoe for adoption.

Mr. S. P. Bush—Does Mr. Simons intend that the shoes presented shall be tested at the expense of the Association or at the expense of the individual?

Mr. J. E. Simons—The party presenting the shoe shall certainly pay for the cost of the test.

Mr. W. E. Symons (Plant System)—It seems to me that two years is too long a time. I would be glad to have this brake shoe matter determined in less than two years. We ought, if possible, to commence these tests at once and conduct them as far as is consistent in the premises and get some definite information from the Committee at as early a date as possible, and I therefore make an amendment to limit the time to one year instead of two.

Mr. G. L. Potter—If I understand the motion, it is that this Committee shall test all shoes presented, not leaving it arbitrarily with the Committee to throw out any they may not think worthy of tests. I think the motion should be modified to some extent, so that the Committee will have that option.

Mr. A. M. Waitt—I hope none of the Committees will be authorized to make a test at the request of a manufacturer or inventor; but only at the request of a railroad company. I would like to make an amendment that the Committee on Brake Shoes be instructed to test such brake shoes as may be presented to them by railroad companies represented in the Association and which seem to have made sufficient departure from those previously tested to have affected their efficiency and durability; and, furthermore, that the Committee indicate to the railroads such time in the year as they intend to make tests, giving an opportunity to the railroad companies to present the shoes.

Mr. E. D. Nelson (Pennsylvania)—I think the Committee should prepare specifications for brake shoes, and if it can do so the whole matter will be simplified. In that case all that would have to be done would be to determine whether any brake shoe pretended to meet the specification.

Mr. G. L. Potter—I will make an amendment that the Committee formulate specifications governing the limitation of the coefficient of friction for a satisfactory brake shoe. The question of the wearing quality is one for the railroad man to settle for himself.

The motion as amended was carried and the meeting adjourned.

SECOND SESSION—TRIPLE VALVE TESTS.

President Schroyer—The first report to be presented is that of the Standing Committee on Triple Valve Tests. The report has not been printed and distributed as have the others, for the reason that it was thought best to have the matter discussed by the Executive Board before it was presented to the Association and that was done last evening and the action taken was favorable to the presentation of the report to the members, that you may be familiar with the work that this Committe is trying to accomplish.

Mr. G. W. Rhodes—At the M. C. B. 1899 Annual Convention the Triple Valve Committee of three members was increased to five members and they were instructed "To carefully consider the present recommended practice with a view to determining if any modification of the same is allowable; that they obtain sets of triple valves and make such tests of same, both on rack and on trains, as may be necessary to give this Association full information as to the construction and operation of such valves, and that they be authorized by and with the consent of the Executive Committee to make necessary expenditures from the funds of the Association, the same not to exceed $5,000."

On October 20th the Committee addressed a communication to the Westinghouse Air Brake Company and the New York Air Brake Company as follows:

"A meeting of the M. C. B. Committee on Triple Valves will be held at the Auditorium Hotel, Chicago, Monday morning at 10 o'clock, November 20th, to consider the action taken at the June M. C. B. annual convention. Our Committee will be very glad to have one or more representatives of the Westinghouse Air Brake Company present. A modification of the present M. C. B. test requirements will be one of the matters that will be considered. A similar communication has been sent to the New York Air Brake Company. Kindly let me know whether your Company will be represented. (Signed) G. W. Rhodes."

Communications were received from both of these brake companies promising to send representatives to the meeting.

A meeting was held at Chicago at the Auditorium at which the following were present: G. W. Rhodes, Chairman; W. S. Morris, A. W. Gibbs, J. O. Pattee, H. H. Westinghouse, of the Westinghouse Air Brake Company; and Mr. C. L. Henry, of the New York Air Brake Company. Mr. W. McIntosh signified his intention of being present, but was unavoidably absent.

At this meeting the Committee went over each individual paragraph of the M. C. B. Association's recommended standard of efficiency for the purpose of hearing what, if any, modifications were desired by the New York Company. The representative of the New York Company did not offer any comments, either in favor of or against the recommendations, stating that his instructions were confined to attending the meeting. As this action rather blocked the work of the Committee it was agreed before adjourning the meeting that the Chairman should address a communication to the New York representative embodying the result of the meeting and stating what information the Committee wished from the New York Company. In accordance with the above the following letter was written:

Chicago, Ill., November 20, 1899.

Mr. Charles L. Henry, Western Representative New York Air Brake Company, Chicago, Ill.:

Dear Sir.—At the Triple Valve Committee meeting, held this morning at the Auditorium, the following line of work was blocked out:

First—To go over the Recommended Practice for "Triple Valves," as shown on pages 447 to 450 of the M. C. B. 1899 annual report, making such modifications as might be mutually agreed upon.

Second—In the event of a modification of the M. C. B. requirements, it was the opinion that the Westinghouse Air Brake Company's triple valves, as well as those of the New York Air Brake Company should be tested, and that the Rack Tests should be followed by Road Tests, to better determine the practical effect of the proposed modifications.

In reviewing the specifications at the meeting, it was the general opinion that the New York Air Brake Company's present triple valve could not comply with the third clause of test No. 2, nor with test No. 10, but that in all other respects it could meet the requirements. As there was no one present who could answer definitely for the New York Air Brake Company, it was decided to postpone consideration of this revision, until you had an opportunity to communicate with your principals.

Will you kindly consider the above, and let our committee know what modifications in the present M. C. B. recommended practice your company would like to have considered, and oblige, Yours truly,

(Signed) G. W. RHODES,
Chairman of Committee on Triple Valves.

Up to February 19th no reply had been received to this communication, although the Chairman of your Committee twice personally called upon the New York Air Brake Company's representative in Chicago, once in the month of November and once in the month of January. On February 19th the following communication was addressed to the President of the New York Air Brake Company:

Lincoln, Neb., Feb. 19, 1900.

Mr. C. A. Starbuck, President New York Air Brake Company, 66 Broadway, New York:

Dear Sir.—Referring to your communication of October 27, in regard to a meeting of the Triple Valve Committee, the meeting was held, and after consulting with Mr. Henry it was decided that the committee should send a memorandum of the minutes of the meeting to him, asking what modifications in the present M. C. B. Recommended Practice the New York Company would like to have considered. This letter was sent November 20, but we have had no response from Mr. Henry. I enclose you copy of the letter.

Our committee would be very glad to have an expression from your company. Yours truly,

(Signed) G. W. RHODES.

New York, February 23, 1900.

Mr. G. W. Rhodes, Esq., Chairman Master Car Builders' Association, Lincoln, Neb.:

My Dear Sir.—I am in receipt of your letter of February 19, and note contents.

Regarding your letter of November 20 to Mr. Henry, of which you enclose copy, we did not reply to it for the reason that we did not think that it is any part of our business to recommend or advise the committee as to what the test should consist of.

We had an idea at one time that it was in our province to do this, and Mr. Massey wrote you at considerable length about it, and also went to Philadelphia and had an interview with Mr. Ely, of the Pennsylvania, but all our recommendations at that time were not only ignored but refused, and we do not care to have the committee treat us in the same way again.

We felt at that time that we did everything in our power to facilitate the work of the Committee and to make the test fair to all parties interested, but the Committee evidently did not look at it as we did, and we prefer not to make any recommendations. Yours very turuly,

(Signed) C. A. STARBUCK, President.

Failing to obtain the co-operation of one of the brake companies, your Committee did not deem it expedient

to make any tests. It does not recommend any changes in the present recommended practice of the Association.

President Schroyer—It seems to me that if we are right in the specifications or the requirements which we laid down in what is to be accomplished in the use of a triple valve on our air-brakes we should know it. If we are not right, we should know it. As I understand it, some of the companies who object to going into a test of this character, do not fully meet all the requirements which were laid down in our specifications for triple valve. Now if they cannot meet that, I think that they should show us wherein we are wrong in the matter and if we are wrong, I am certain that we would be able to correct them.

Mr. G. W. Rhodes—You will notice in the report the nature of the claims by one of the air-brake companies and which on the face of it, seems to be rather against the Committee, as though the Committee had not given the consideration that they ought to have given; at one time the New York Company did ask the Committee for a change in its specifications and the Committee would not concede the change. At the present time, however, the Committee was willing to go over this test question and to consider any changes which might be considered advisable. Now it might be asked, probably, why the Committee make this change of front and I think I can explain it.

It is generally conceded that the tests of 1886 and 1887 were very thorough and very careful and the specifications which were finally adopted by the M. C. B. Association were mapped out after these careful and thorough tests had been made. At that time the Committee of this Association were all close to the road tests and rack tests, and were familiar with their work and with what the results might be if specifications different from those adopted were brought about. And when we were asked to change those specifications we naturally did not feel inclined to change them. But since that time improvements have been made in brakes, improvements have been made in car equipments, speeds have been increased, loads have been increased, and it might possibly be that conditions and specifications for brake requirements which were deemed essential and desirable in 1887 and 1888, might be subject to modifications at the present time. And, therefore, the Committee was quite willing, and personally I believe it is quite time, to make a reinvestigation of this important subject and if it is found that the specifications are too severe and are not applicable to the present demands of railroad service, modify them. On the other hand, if it is found that, in any respect, they are too lenient and not in keeping with the present requirements of tonnage and speed of railroads, make them more severe. But in any event, I believe that it is a good time to make an investigation of the matter and it was with that in view that the Committee was quite willing to reinvestigate the work of the Association, which is about ten years old. Now we were not able to do it.

Some persons will perhaps ask, "Why didn't you do as the Convention proposed, anyway, and buy the triple valves and make the tests?" The work of this Association has all been voluntary and co-operative work. I do not believe any investigations of the manufacturers' products have been made against the wishes of the manufacturers. Up to the present time the Committees have always had the co-operation of the manufacturers and our Committee did not believe that it would be wise to take devices against the wishes of the manufacturers and make public tests; we did not think that was the function of the Master Car Builders' Association or the Master Car Builders' Committee. It might have been the function of other bodies to do that but we did not think it was the function of the car builders to do it.

Mr. F. A. Delano—In the letter of Mr. Starbuck, addressed to the Committee, he refers to the suggestion made by Mr. Massey but does not give the date of those suggestions. I do not know whether they were very recent or a number of years ago, but I judge from the tone of his letter that the same suggestions that were made at that time would give in a general way their ideas of what their recommendations would be. If that is a fair assumption, I should think it would be of value to the Association for this Committee to consider again, as Mr. Rhodes has suggested, their specifications in the light of those suggestions.

Mr. S. P. Bush—As I understand the report of the Committee, Mr. Starbuck writes they have since changed their minds on those suggestions and they say now that there is nothing further to suggest; they have nothing further to suggest and I really cannot see what the Committee can do. Now I would like to, as Mr. Rhodes says, see some discretion in the matter and I for my part cannot see a great deal to say except that there is not any indication thus far that the requirements should be changed though the whole question with me is how to make what brakes we have got do better, which does not come within the scope of the existing Committee.

Mr. G. W. Rhodes—I am afraid the Committee cannot give the convention much light on the matter. The Committee fully expected to make tests of the New York triple and partly on that account, perhaps partly on account of being busy men believing that they would eventually make a thorough investigation of it, I do not think there is a member of the Committee that has given much attention to the construction and operation of the New York triple and therefore we are not in a position to criticise them either favorably or unfavorably, and if you will notice in the report to the President of the New York Company, all that we called attention to was two items which it was the opinion of the meeting held in Chicago, that the New York Company could not meet. We did not say they could not meet it because we did not know, but it was the opinion of other men who attended the meeting that in those two respects the apparatus could not meet the Master Car Builders' requirements. On that account, I do not think that any member of the Committee is prepared, except from hearsay, to give any opinion as to what respects the New York Company's triple does not meet the requirements.

Mr. B. Haskell—I would like to know this morning what the objections are to the Association making the tests. I would like to get the matter settled at once.

Mr. W. S. Morris—In reply to Mr. Haskell I think the Association is doing everything that it can, through its Committee, to make these tests for the information of the members. The report of the Committee, of course, does not include some points that have been represented by the New York Air Brake Company which, possibly, might have some bearing on the question if it was given to the members. I have tried to take a personal interest in this work and I am sure the Committee has acted as fairly as it is possible to do. Last year, you are aware, that two members of the Committee were chosen for the reason that they handled New York Air Brakes. The Chairman has explained that one of the members was not present and one was present. Now we have made no tests of the New York Air Brake but it is possible some of us have made some investigation of the individual triples. I know I have looked into it some, that is, I have investigated on our road New York triple valves as compared with those that we used as a standard. I have had the New York people have a representative with us for a time. I cannot say that this investigation was carried on when their representative was there but I can say that the New York people claim that its application in emergency being so much quicker, it was equal to the additional pressure that was introduced into the cylinder by the emergency feature of the Westinghouse. Of course, we could not tell what that would be on the regulation test train under the Master Car Builders' requirements.

It seemed to be a good point, however, and I personally urged their representative to give us the triples and go into the test and I was sure that the Committee would be glad to make any recommendations to the Association that were right. The matter ended there and I think we have taken every possible means, but the New York people seemed to think that a test is not necessary. That they feel that they have a good brake in service; they object to the rack test and depend on the service test which the Committee proposed to make in connection with the rack test.

In speaking of this individual investigation that I have made, I speak as the representative of my own road, not as a member of the Committee. However, that information has been talked over in the Committee meetings and I believe if all the air-brake companies—there is another air-brake coming on the market—give us their co-operation for a test, there will be no reason for them to feel that we won't give them justice. I think that is what the Association is after.

Mr. G. R. Joughins (Intercolonial)—I think it is generally conceded that the New York Air Brake cannot fulfil some of the requirements of the Master Car Builders' recommended standard and I think in the minds of some there is a suspicion that it cannot fill some other requirements. In my experience of the New York triple, which has been, I must say, rather limited, I have not found that this suspicion about the working of the other parts of the apparatus has been well founded.

A motion of Mr. S. P. Bush to adopt the report containing the recommendation that the present triple valve requirements remain unchanged was carried.

The remainder of the session was given to the discussion of the Rules of Interchange.

For a list of exhibits see page 416.

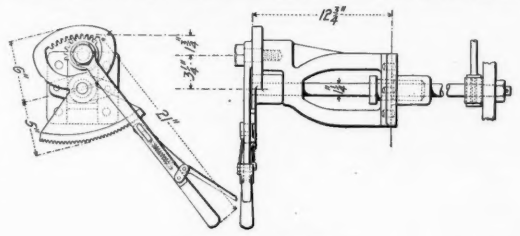
What Is the Ideal Fast Passenger Engine?

BY S. M. PRINCE, JR.*

I was much interested in the editorial entitled "Some Fundamental Distinctions in Locomotive Types," printed in the *Railroad Gazette*, of Dec. 15, from the fact that the judgment as therein expressed, covering the limitations as to capacity of the different designs of engines, seemed to me to be erroneous as to the 8-wheel American and 10-wheel types as against the so-called "Columbia" and "Atlantic" types. I have had it in my mind to take up the other side of the question at first favorable opportunity, and it seems that no time is more opportune than now.

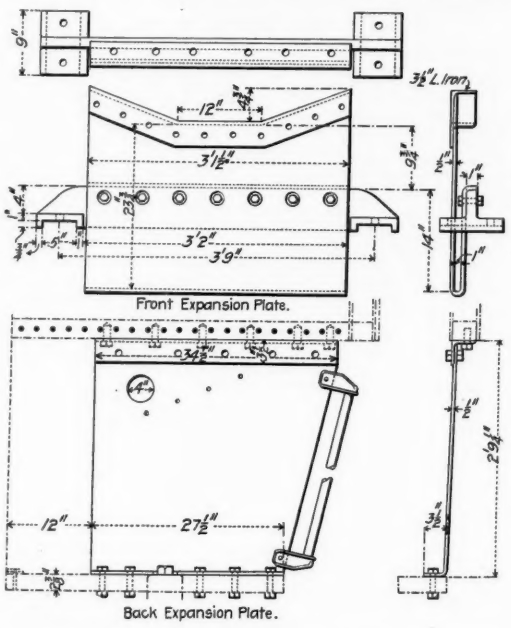
To the best of my knowledge and belief, I was the first to sketch the outlines of the "Columbia" type of engine. This I did in December, 1882, when connected with the New York, West Shore & Buffalo Railroad. The engine then outlined had cylinders 20 in. in diam. by 24 in. stroke, driving wheels 84 in. diam., leading or pony truck wheels 42 in. diam., trailing wheels 48 in. diam. and boiler of the "Wootten" or "wide firebox" type, 60 in. diam. with firebox 8 ft. wide by 9 ft. 6 in. long. The sketch was an outgrowth of the study I had given the question as to how to obtain a high speed locomotive without needless shock to the nerves of the old-time railroad managers, who shuddered at the thought of a high locomotive center of gravity. While I felt such design of engine a possibility, I could not arrive at the conclusion that, all things considered, it would best inure to the advantage of both engine and track. After adding to and subtracting from this preliminary design for nearly two years, I abandoned the conception, arriving at the conclusion that the only true high-speed engine would be one with a wide or Wootten firebox and large driving wheels placed under the firebox, or, in other words, an American type engine, raised up sufficiently high to accommodate the size of driving wheels.

In concrete support of this judgment, although at a late day as to my original thought, I send you herewith a



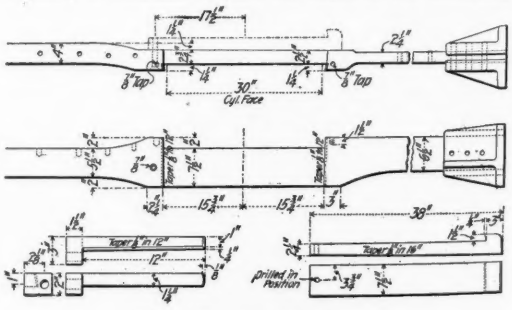
Throttle Rigging.

photograph and blue prints showing a design of this class of engine which we have recently turned out of our shops. (See illustrations and appended specifications.) This is a remodeled passenger engine which originally had driving wheels 68½ in. diam. It has now 78 in. diam. driving wheels, and such other changes were made in design as were of necessity the outgrowth of the substitution of the larger drivers. The height of center of boiler above rail you will note is 9 ft. 2⅜ in. This is the old boiler raised up, but had we been obliged to put a new boiler on the engine, it would have been so designed that we could have used 84 in. diam. driving wheels and



height of center of boiler would have remained the same. In raising the boiler, it became necessary to remove pop valves and whistle from top of dome and place them on an auxiliary dome or turret on boiler, back of cab. I send herewith general information covering the details. I firmly believe this to be the ideal type of high-speed passenger engine.

You will note, from weights given on driving wheels and truck, that an engine of this type could be designed of greatly increased capacity without exceeding the maximum weights now allowable on parts as mentioned. When capacity is demanded beyond the limits of the American



Front Frames and Keys.

type, then add another pair of driving wheels, not trailers of the "Columbia" or "Atlantic" type. Nothing can be said in favor of the Columbia or Atlantic types as against the ten-wheel type. The conditions as to rigid wheel base are practically the same, with the advantage in favor of the 10-wheel type that the weight on its trailer is used for tractive purposes, which will permit increased cylinder capacity with such addition to boiler volume as to add little to the total weight. Nothing has been accomplished by the Columbia or Atlantic types of engines that can not be more satisfactorily accomplished by the 8-wheel American and 10-wheel types. In this connec-

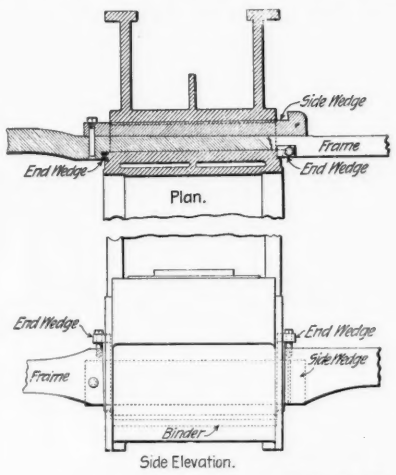
*Supt. M. P. & R. E., Philadelphia & Reading.

tion I may state that the writer several years ago outlined an engine of the American type here dscribed, with 84 in. diam. drivers and center of boiler 9 ft. 3 in. above rail. In the high speed Atlantic type engines of recent design the center of boiler is as high above the rail as in the American type with large drivers here described, the element determining the height of boiler being the cylindrical part of the shell in its relation to the driving wheel clearance. Such being the case, why the Atlantic type as against the American?

I really have not been able to discover any good reason for the building of the Columbia and Atlantic type engines, except to show a possibility in locomotive design; and as between these two types I incline to the Columbia as the more preferable design, its shortcomings heretofore being confined to its method of spring suspension. This is a matter of detail design, does not affect design as a whole, and is easily remedied.

Taking up some of the details of our Engine 218, I will state that the driving wheel centers are cast solid, of steel. That is, the rim is not parted at several points, usually four, in order to take care of the shrinkage, but provision is made for this by making the mold sufficiently elastic to accommodate this condition. I have always felt that a more nearly perfect casting, as to internal strains, in either iron or steel, could be obtained by being cast in an elastic mold which would absorb the shrinkage, than could ever possibly be obtained by artificial provision in the casting itself when cast in a non-elastic mold. This applies to castings to be either annealed or unannealed.

The wheel center pattern is made solid with draft in one direction, the outside face of wheel being molded in the drag, the inside face being in cope, and mold coped down to juncture of straight face of spoke with the round of spoke corner. After the wheel was designed prints



Cylinder Fastenings—P. & R. Locomotive, No. 218.

were sent to several of the prominent steel-casting makers of the country inviting their criticisms of the design; also their opinion as to the possibility of making the casting solid, the mold to be designed as heretofore described. They were all favorably inclined towards the design, but were a unit in advocating shrinkage provisions in the rim. One firm became more interested than the rest and sent its representative to investigate the possibility of carrying out our suggestions. As a result of his investigation, he agreed to make the trial and as a further result the centers were cast as we desired. I will state that these castings were not annealed, as the maker had not a furnace large enough to admit them. I believe these to be the largest driving wheel centers ever cast in this manner.

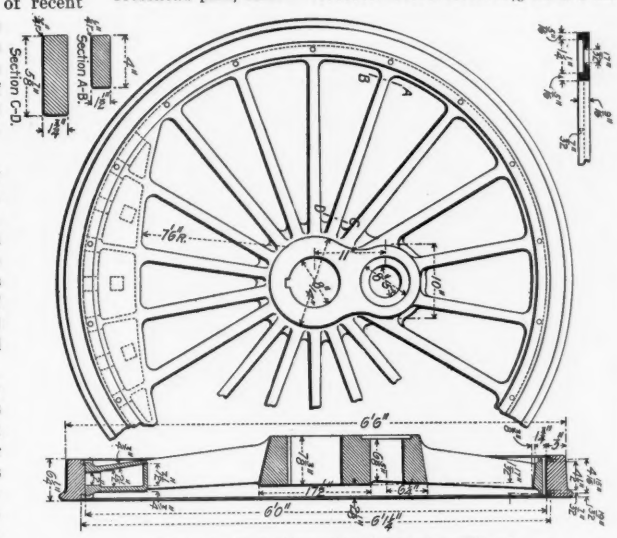
As another feature, I may mention that the cylinders are secured to engine frames without the use of bolts—one horizontal wedge, two vertical end wedges and a horizontal clip, forming the connection. A patent has been allowed on this construction.

The boiler expansion braces are of plate, the front brace being bent in U shape in order to increase the range without undue strain because of high point of support on frames. The guide yoke plate brace is extended outward at either end to form running plate brackets, which gives firm support to the plates. The throttle rigging is of special design as drawing will show. A left-hand Westinghouse air pump is used which simplifies the arrangement of piping. The other details need no further comment. A table of descriptive specifications follows:

Gage of track	4 ft. 8½ in.
Fuel	Anthracite coal
Weight on drivers	76,300 lbs.
Weight on truck wheels	39,400 lbs.
Weight, total	115,700 lbs.
Wheel base, total of engine	21 ft. 1 in.
Wheel base, driving	7 ft.
Wheel base, engine and tender	47 ft. 4½ in.
Length over all, engine	33 ft. 8⅝ in.
Length over engine and tender	57 ft. 11⅜ in.
Height, center of boiler above rails	9 ft. 2⅝ in.
Height of stack above rails	14 ft. 3 in.
Heating surface, firebox	169 sq. ft.
Heating surface, tubes	1,168 sq. ft.
Heating surface, total	1,337 sq. ft.
Grate area	76 sq. ft.

Wheels and Journals.

Drivers, diameter	78 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	33 in.
Journals, driving axle, size	8½x12⅛ in.
Journals, truck axle, size	5½x10 in.
Main crank pin, size	5½x5 in.
Side rod pins, size	5 in. x 4½ in.
Crosshead pins, size	3⅞ in. x 3 in.



Solid-Centered Cast-Steel Driving Wheel.

Cylinders.

Cylinders, diameter	21 in.
Piston, stroke	22 in.
Piston rod, diameter	3½ in.
Main rod, length center to center	7 ft. 3 in.
Steam ports, length	19 in.
Steam ports, width	1⅝ in.
Exhaust ports, length	19 in.
Exhaust ports, width	3 in.
Bridge, width	1¼ in.
Valves	Richardson balanced
Valves, greatest travel	7 in.
Valves, outside lap	1¼ in.
Valves, inside clearance	⅛ in.
Valves, lead in full gear	1-16 in.
Valves, lead	Variable

Boiler.

Boiler, type of	Straight, Wootten firebox
Boiler, working steam pressure	160 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	⅝ in.
Boiler, diameter of barrel at front sheet	67½ in.
Seams, horizontal	Triple riveted
Seams, circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheets	⅝ in.
Crown sheet stayed with	Radial stays
Dome, diameter	27¼ in.
Tubes, number	324
Tubes, material	Iron
Tubes, outside diameter	1½ in.
Tubes, length over sheets	9 ft. 2¼ in.
Firebox, length	9 ft. 6 in.
Firebox, width	8 ft. ¼ in.
Firebox, depth, front	38¾ in.
Firebox, depth, back	38¾ in.
Firebox, material	Steel
Firebox, thickness of sheets	5-16 in.
Firebox, brick	Wall at front of furnace
Firebox, water space, width, front	3½ in.
Firebox, water space, width, sides	3½ in.
Firebox, water space, width, back	3½ in.
Grate, water tubes with cast iron bars and four drop grates.	
Smokebox, diameter	61½ in.
Smokebox, length from tube sheet to end	36⅜ in.

Other Parts.

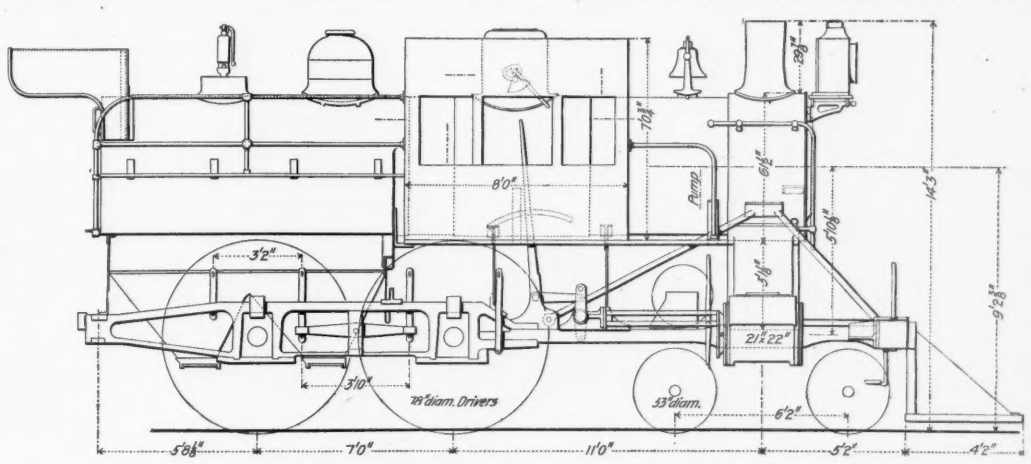
Exhaust nozzle	Single
Exhaust nozzle	Fixed
Exhaust nozzle, diameter	4⅝ in. to 5 in.
Exhaust nozzle, on center line of bottom row of tubes.	
Netting, wire or plate	11-wire, 3-mesh per inch
Stack	Taper
Stack, least diameter	16 in.
Stack, greatest diameter	17½ in.
Stack, height above smokebox	29⅞ in.

Tender.

Type	Eight wheels, swivel
Tank capacity for water	4,000 gallons
Coal capacity	5 tons
Material in tank	Steel
Thickness of tank sheets	3-16 in.
Type of under-frame	Channel iron
Type of truck	Pedestal, rigid center
Type of truck spring	Semi-elliptic
Diameter of truck wheels	33 in.
Diameter and length of axle journals	4½ in. x 8 in.
Distance between centers of journals	77½ in.
Diameter of wheel, fit on axle	5½ in.
Diameter of center of axle	4½ in.
Type of truck transom	Channel angle and bar iron
Length of tender frame	22 ft. 6 in.
Length of tank	20 ft.
Width of tank	8 ft. 8 in.
Height of tank, not including collar	4 ft. 4½ in.
Height of tank over collar	5 ft. 1½ in.
Type of back drawhead	M. C. B.
Water scoop	With

Specialties.

Wheel centers	Standard Steel Co.
Tires	Midvale
Axles	Midvale
Sight feed lubricators	Detroit
Front and back couplers	Gould
Safety valve	Prince muffled 3 inch
Cylinder frame connection	Prince boltless
Steam hose coupling	Gold
Reducing valves	Foster
Sanding devices	Leach
Injectors	Sellers
Driver brake equipment	Westinghouse
Tender brake equipment	Westinghouse
Tender brake beam	Sterlingworth
Tender brake shoe	Lappin
Driver brake shoe	Lappin
Air pump	Westinghouse
Air pump governor	Westinghouse
Piston rod packing	U. S. Met. P. Co.
Valve rod packing	U. S. Met. P. Co.
Injector checks	Prince patent



Philadelphia & Reading Passenger Locomotive, No. 218.

The M. C. B. Reports.

We print below abstracts of the various committee reports presented at the annual convention of the Master Car Builders' Association at Saratoga. The discussions on these reports appear (so far as we had received them up to the time of going to press) in the current report of the convention and the publication of them will be concluded next week.

BRAKE SHOE TESTS.

At the time of last year's convention, it was thought it would be desirable to make further tests of brake shoes during the year, on account of new brake shoes being introduced. The committee, however, finds there are so many of the brake shoes now being presented that are still in an experimental condition, that it would not be wise to go to the expense of conducting further tests until some of those that are already on trial shall have demonstrated their efficiency in service sufficiently to lead the committee to believe that they will continue in use.

This report is signed by S. P. Bush, George Gibbs and R. P. C. Sanderson.

AIR-BRAKE APPLIANCES AND SPECIFICATIONS FOR AIR-BRAKE HOSE.

It seems to the committee that those in charge of motive power and car departments on railroads should see that employees, who have to do with the repairs, maintenance and adjustment of air-brakes on cars, give more attention to the importance of a correct piston travel in order to have the brakes operate as nearly as possible at their point of maximum efficiency. The committee would call attention to the great neglect regarding the proper care of air-brake cylinders on freight cars. Many seem to think it simply necessary to remove the oil plug in the cylinders and put in a quantity of inferior-grade oil, leaving the packing leathers oftentimes hard and badly cut or worn. Experience seems to show that a light grease is more advantageous to use than a heavy oil, and it has also been found desirable to have the cylinders made without any oil hole, thereby making it necessary, whenever the cylinder is to be oiled, to take off the cylinder head. At the same time the lubricating is done the packing leather and rings and the inside of the cylinder will then receive proper attention in the way of cleaning, and any other repairs required. The committee believes more attention should be given to reducing the number of elbows that are found in the piping of many cars. Every sharp bend in the pipe means a retarding of the action of the brake and added friction in the movement of the air through the pipes. As far as possible, in designing air-brake piping for cars, "ells" should be eliminated and long, easy bends substituted.

It has been suggested by one of the air-brake companies that on Plate 9 of the Association Standards for Air Brakes on Freight Cars, the dimension showing the

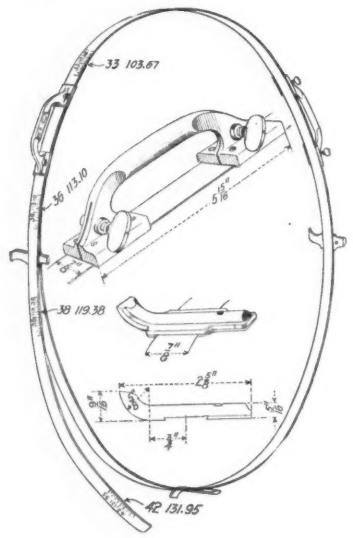
location of angle cocks should be given, as well as the angle at which this cock should stand with reference to the vertical. The committee would recommend that this feature be referred to the Committee on Supervision of Standards, for them to consider and make definite recommendations at our next convention in 1901. The committee does not believe that it would be advisable to continue a general committee on Air-Brake Appliances and Specifications for Air-Brake Hose at the present time, but there would seem to be an opportunity for a special committee to take up the subject of the Use of Slack Adjusters and the Consideration of the Necessity of Additional Brake Power on High-Capacity Cars, together with the subject of Specifications for Brake Beams for High-Capacity Cars. It has also been recommended by some that further consideration be given to the subject of Air-Brake Hose Specifications by a committee which would take up this subject exclusively.

This report is signed by A. L. Humphrey, Chairman; A. M. Waitt and W. H. Marshall.

WHEEL CIRCUMFERENCE MEASURE.

The design of the present wheel circumference measure was presented by the committee on Standard Wheel Gage at the convention held in June, 1882, but as some matters connected with the report of this committee were not concurred in by the Association, they were referred back to the committee to report at the adjourned meeting in October, 1882, and in the report of proceedings of this meeting this wheel circumference measure is first shown among the standards. At the 1883 convention, the executive committee was instructed to revise the resolutions relating to standards and report at the next annual convention, which it did in 1884, and so far as the wheel circumference measure is concerned, it simply confirmed the action of the 1882 convention, namely, that this measure should be used in all repair and car building shops.

In February of this year the committee issued a circular of inquiry asking what changes, if any, were desirable to be made in the present design of wheel circumference measure, and among the replies received a design, shown by the accompanying engraving, was submitted by



Proposed Wheel Circumference Measure.

one of the members which meets with the approval of the committee. It will be observed by reference to this illustration that at proper distances on the gage there are vertical marks indicating the correct theoretical circumference measure for 33-in., 36-in., 38-in., and 42-in. wheels, the same information being given for 26-in., 28-in. and 30-in. wheels in their respective positions. On the left-hand side, at the top, the diameter of wheel indicated is stamped, and on the right-hand side the correct corresponding circumferential measure in inches and hundredths of an inch, thus: 33-in. wheels 103.67; 36-in. wheels, 113.10; 38-in. wheels, 119.38, and 42-in. wheels 131.95.

On each side of the vertical lines are spaced six shorter vertical lines ⅛-in. apart. By this method of measurement, if a wheel were exactly the correct circumference the indicating slide on the scale would cover the center line. If the wheel were larger in diameter the indicating slide would fall short of the center line by 1, 2, 3, 4 or more marks, and such a wheel would be indicated as + 1, + 2 or + 3, etc., showing that the circumference of the wheel was ⅛ in., ¼ in. or ⅜ in. more than the correct standard. If the indicating slide extended beyond the center line, the circumference of the wheel would be less than the standard and would be indicated in the reports as — 1, — 2, — 3, etc., showing that the wheel was ⅛ in., ¼ in. or ⅜ in. less than the proper size.

The committee believes that by this method of measurement more uniformity in the matter of inspection and mating of wheels can be obtained, and the inspector will have a clearer idea of what the marks on his circumference measure really indicate. The committee would recommend the adoption of this measure in lieu of the present wheel circumference measure.

This report is signed by J. J. Hennessey and E. S. Marshall.

JOURNAL BOX, BEARING AND WEDGE FOR CARS OF 100,000 LBS. CAPACITY.

Plans for a journal box, brass, and wedge for 5½ x 10-in. axles were shown.

In preparing these plans it has been the aim to design the parts, as far as possible, with a view of using present standards without detriment to the design. This has been found practicable with regard to the journal box lid only. The present standard lid for 5 x 9-in. boxes is of sufficient size to cover the necessary opening in the proposed 5½ x 10-in. box, by reducing the overlap on each side. We recommend the box to be made with a circular bottom, as it has all the advantages that have already been discussed relative to that point; at the same time it is recommended to allow the square bottom to come under the list of standards for any who may prefer this bottom, either for a larger oil capacity or other preference. We desire to call attention to the fact that the box, wedge and brass, as described, will interchange with the box, wedge and brass now in use on about 15,000 100,000-lb. capacity cars, which are practically all the cars of this capacity now being operated. In the preparation of the drawings the notations allow of the same elasticity in preference to materials, etc., as was decided and adopted in the case of the same parts for the 80,000-lb. car.

This report is signed by Wm. Garstang, Chairman; J. J. Hennessey and W. H. Marshall.

STANDARD CENTER PLATES.

This committee presented replies to a circular letter which are very indefinite. It would seem that while some get good results from using pressed steel center plates others find that they fail by crushing under load and on account of these plates being too shallow, cars, in switching, are knocked off their centers, breaking the king bolts; in other cases pressed steel plates are broken on account of deflection in the bolsters. There is also a variety of opinion as to malleable iron center plates, but a number report that they are too soft and are unsatisfactory on account of breaking. Better results are given if center plates are oiled. In the same way some do and some do not get good results with cast-iron center plates.

Cases are reported of pressed steel, malleable iron and cast-iron plates becoming crushed and rusting fast so that the trucks will not swivel, and in some instances derailments have resulted. Some prefer center plates with wide faces and some with small faces. There has been very little experience with so-called frictionless center plates, but two roads report them as giving good results. Only one road reporting has used center plates designed to permit of an adjustment of the height of the car. Extracts from the committee's report are as follows.

The committee feels bound to call attention to those answers wherein the blame or failure of pressed steel or malleable iron castings are attributed to light construction. Another feature we would mention is shown by steel and malleable center plates crushing under load and becoming so fixed that they will not permit the car trucks to curve. This, we believe, is brought about by the excessive length of pressed steel, malleable or cast-iron center plates. It is an established fact that wooden bolsters, or wood and iron combination bolsters, will spring, and it necessarily follows that the long center plate must spring with the bolster. If of light construction, this curvature will necessarily force the outer edges of the center plate inward. This action will nip the bottom section fast, causing a rupture, either by separation of the lower, or bearing part of the center plate, or where it curves to form the circle. This would explain the many answers claiming that breakage was due to load, and bottom or top section crushing out. The committee, therefore, would advise shortening the bearing of the center plate as much as possible, thus reducing the bearing surface lengthwise of the bolster.

There should be some relative dimensions governed by load for center-plate construction. Those loading cars should have impressed upon their minds the importance of loading the cars as evenly as possible, so that the cars will be "trim." Assume that the car is loaded evenly and that the load on one center plate is about 4,000 lbs. Assume further, that 400 lbs. to the square inch of surface should be the general rule for center-plate service, and there will be required a center-plate about 12 in. in diam., less the space of 2 in. for king bolt and 1¼ in. for inside ring, which would give about 100 sq. in. bearing surface. The surface of this center-plate being flat, with an emery wheel it could readily be smoothed off. This would give, comparatively, a smooth surface upon which the 40,000 lbs. would rest. It is claimed by some that this surface would tend to make the car resist curving, but, in practice, the movement of the bottom and top center plates upon each other hardly exceeds 3-16 in. on a 12-in. circle, and we have repeatedly sent cars over switches and curves with as high as 18° curvature, marking the center plate and following alongside the car watching the mark, and did not see any movement on the center-plate under load even on such extreme curvature. It was found that the adjustment was made more through the agency of the axle and arch bars in 70 per cent. of the cases examined than through the adjustment of the center-plates.

The second condition is that of the center-plate shape. It is understood that metal bolster makers claim a large saving in train friction by the use of their bolsters from the fact that the metal bolster will maintain its general contour under any load, thus assuring, under general conditions, that the car will not ride on its side-bearings. Such being the case, on what principle of adjustment do our builders construct a ball or dished-shaped center-plate? It is evident that a ball surface of sphere offers the least resistance to a rolling motion, and there is no constructor who would believe that a car, mounted on two 20-in. balls, would maintain its position going around a curve at a rate of 20 miles an hour for as many minutes. That they fear displacement is shown by the construction of a ring at the bottom of the circle that limits, if it does not prevent, the rolling motion that they expected to receive when the ball or center plate was evolved. As long as the inner ring remains in position, reinforced by the king-pin, the car retains its position upon the truck, but should sufficient force be exerted to cause the breaking of this ring, the same force will break the king bolt and cause displacement of the center plates. Another feature in this construction that is very much in evidence is the listing of the cars to one side bearing, then to the other. With a ball center plate, if the car should list, what is there to cause the car to assume a vertical position? Must it not remain upon the side-bearing until the trucks find some high place on the rail to enable it to toss the car over to the opposite side-bearing? If this is a fact, then is it not also a fact that the car must be literally tossed from one side-bearing to the other or remain permanently upon one side bearing, increasing flange wear? As there is nothing to prevent the rolling motion to this ball center except a tight fit around the center ring or king bolt, what advantage can be claimed in a construction that necessitates a condition which nullifies the advantages that the metal bolster makers claim in their construction of rigid bolsters?

In contradistinction to this ball or dish-shaped center-plate, the flat center-plate presents many advantages in maintaining the vertical position of the car and assisting the car to re-adjust itself. It frees the side-bearings of all dead weight, offers protection from truck displacement by its heavy outer ring assisted by the inner ring and king bolt; it can be kept oiled or greased and can be made smooth with an emery wheel, thus reducing friction to a minimum.

This report is signed by R. H. Johnson, Chairman; George T. Anderson and H. L. Preston.

SIDE BEARINGS.

Standard Spread.—In the replies received to a large number of inquiries issued, the importance of a standard spread seemed to be regarded secondary to the necessity for clearance. Although this is a feature of much importance, it was found that the distance from center to center of the bearings, as practiced by a large number of companies, did not vary sufficiently to occasion controversy or affect the results in service; the difference being from 53 to 62 in. Viewed from a standpoint of safety, less liability to danger would attach to the location of side bearings too far from the center of the car than if too near, the possibilities of accident from the car tipping increasing under the latter condition. The committee is of the opinion that a correct location would be as nearly over the truck springs as possible, in order to satisfactorily transmit the weight imposed on the bolster. In the common type of freight car truck the springs are located centrally with the arch bars, and the impracticability of placing the side bearings in the same line, by reason of interference with the arch bars, is apparent, except in the case of swing motion trucks. It is therefore believed that the most satisfactory location is just within the arch bars, or about 60 in. from center to center of the side-bearings. A large number of roads at present specify this dimension, and inasmuch as the total variation in nearly all cases is small, there would probably be no difficulty in establishing it as the standard. The approximate uniformity in this measurement is taken as an evidence that it is recognized as the best practice, and the committee recommends that 60 in. be adopted as the standard. The fact that this figure can not be used in all instances with swing motion trucks has not been overlooked; but as a small percentage of the cars being built have this type of truck, it is believed the use of the standard recommended would be but slightly affected.

In agreeing upon a standard spread the committee would also emphasize and advocate the adoption of a standard height from the top of the bottom side-bearing to the bearing surface of the bottom center plate. While not affecting the design of the bearing itself, it will permit the interchangeability of trucks where the standards have been observed. The absence of more definite information as to the specifications of the different roads on this point, prevents the committee from recommending a height, expressed in inches, which could be adopted without inconvenience.

Side-Bearing Clearance.—In view of the discussion which has arisen at different times in the past, relating to side-bearing clearance and the advisability of carrying the weight of the car body and load on the center plates entirely, or equally distributed on the side-bearings and center-plates, it was somewhat of a surprise to find expressed in the replies to the committee's circulars of inquiry, a unanimous opinion in favor of carrying the load on the center-plates, and, with one exception, a clearance between the side-bearings advocated. As these recommendations represent the results of long experience, observation and tests, it would seem unnecessary to go into lengthy detail as to the relative merits of the two conditions. However, to add more information, if possible, and confirm the prevailing opinion, the committee made a series of tests with a view to determining the relative resistance under the different conditions.

A box car of late design, with a capacity of 30 tons,

was used. The body bolsters were of the double leaf iron type, with a 10 x ¾ in. top plate and 10 x ⅞-in. bottom plate; the regulation cast-iron thimbles being interposed between the members at the sill bolts, and with a cast-iron filling block at the center. The car had rigid trucks, with Simplex truck bolsters, and a 15-in. channel-iron spring beam. The weight of the empty car was: Body, 18,700 lbs., and trucks, 11,400 lbs. The total weight was 30,100 lbs.

The car was loaded with 100 car wheels, weighing 60,800 lbs.; the weight on each truck being equalized by placing 50 at each end of the car. Adding the weight of the car body will give a total weight of 79,500 lbs. on both center-plates. The total area of contact surface of center-plates was 56.56 sq. in., which, with the weight stated, is equivalent to 1,405 lbs. per sq. in. on the bottom center plates, with the car body clear of the side-bearings.

An inclined track with a grade of 4 ft. in 100 ft., having a 15° curve at its base and leading to a straight track, was selected to make the tests. In all cases the loaded car was placed on the incline, with the center line of the front pair of wheels at a point 125 ft. from the beginning of the curve, where it was held with the hand brakes. It will be observed that the car would have a drop of 5 ft. on the inclined tangent, then traversing the curve; the distance traveled on the straight track was recorded as demonstrating the results sought for.

In the first test the car was adjusted empty to give a clearance of ¾ in. between each of the side bearings. After the car was loaded there was no appreciable deflection. Thus the entire weight of the car body and load, or 79,500 lbs., was imposed on the center plates, that is, 39,750 lbs. at each end. The car was placed on the incline at the point stated; the brakes were released as quickly as possible, whereupon it started and moved rapidly until the curve was reached, where the speed slackened; after reaching the straight track the car resumed its normal position with respect to the side bearings, and traveled 345 ft. before coming to a stop. The rounding of the curve seemed to be attended with but little friction, and in riding on the car there was no perceptible shock or straining.

The height of the side bearings was then adjusted to distribute the weight on the center plates and side bearings as equally as possible. The contact area of the side-bearings was 15 sq. in. each or 60 sq. in. for the four; adding the area of the center plates gives a total of 116.56 sq. in. carrying the car body and load, which is 682 lbs. for each sq. in. The same procedure was followed as in the previous test, and in four trials the car traveled an average distance of 197 ft. In each instance the car rode very hard, and the sudden slackening of speed when the curve was reached produced considerable shock and straining to both body and trucks.

The car was then equipped with anti-friction side-bearings having two chilled iron rollers to each bearing, connected with top and bottom seats with chilled surfaces for the movement of the rollers. The adjustment was such as to produce equal weight on center plates and side bearings. The average distance traveled in four trials under these conditions was 345½ ft. The freedom of movement seemed to be about the same as in the first test with a clearance between the side bearings. The car was then raised off the side bearings ⅛ in. This did not result as satisfactorily, as indicated by the distances traveled in making this test, the average of four trials being 311 ft. There was no difference noticed in the conditions, when the car rounded the curve, compared with the preceding test.

For the convenience of comparison, a table is given herewith summarizing the results of each test, expressed in feet traveled on the straight track after the car had traversed the curve:

	Side Bearing Clearance.	Weight on Side Bearings	Anti-Friction Weight on Bearings.	Anti-friction ⅛-inch Free.
First trial	345 feet	203 feet	325 feet	284 feet
Second trial ..	...	197 "	335 "	346 "
Third trial....	...	176 "	372 "	303 "
Fourth trial...	...	212 "	350 "	...
Average.....	345 "	197 "	345½"	311 "

Comparison of Tests and Remarks.—The results of the tests would indicate that the most satisfactory condition for service would be to have the weight carried on the center plates, and with a clearance between the side-bearings. While the anti-friction bearings under certain conditions produced an average slightly better, the difference is insignificant. Furthermore, it would appear that a correct adjustment is necessary, otherwise the results would not be as satisfactory.

With a clearance between the bearings the car traveled 148 ft., or 75 per cent. farther than when the entire weight was equally distributed between the side bearings and center plates. It is, therefore, apparent that a greater force would be required to haul a train in the latter condition; the increased resistance not only entailing additional cost in power, but reflecting an increased cost in flange wear of wheels, wear on the rails and general wear and tear to the car body and trucks, due to shocks from unevenness of track, frogs, crossings, etc., occasioning a severer service when the car is down on the side bearings, more so than if the trucks had freedom of movement at the side-bearings, vertically, as is the case when there is clearance.

The fundamental requirement in maintaining this clearance is a construction of truck and body bolsters which will insure a minimum amount of deflection. The committee is of the opinion this can not be obtained with wooden bolsters, as the possibilities of deflection in their use demands a greater clearance at the outset, and the clearance, unless given frequent attention, gradually disappears. It is believed the best results can only be obtained from a good form of metal bolster. In the matter of distance between the top and bottom side-bearings, or the clearance, the committee agrees with the majority of the recommendations received, that this should be from ¼ to ⅜ in. with metal bolsters; but it is unnecessary to establish an arbitrary figure, if the amount of clearance approximates the figures stated. With wooden bolsters this dimension should be greater, for the reasons previously stated, or from ½ to ¾ in.

The extent of contact surface of center plates is also considered an important factor as influencing the proper movement of trucks in traversing curves and in relation to the side bearings. It is well understood that safe practice opposes excessive weight for each sq. in. of bearing surface; and that better results will be derived from center plates with large area than if too small. The ones used under the car in making the tests had a bearing area of 28.28 sq. in. each, producing 1,405 lbs. per sq. in. with a car body and load of the weight stated. The committee considers this plate too small, and is of the opinion that the size should be such as will impose about 800 lbs. per sq. in. of contact surface.

As to anti-friction side-bearings, the committee has not been able to satisfy itself that this type of bearing has attained a sufficient degree of perfection, as far as can be learned, to insure superior results compared with the present practice, considering the increased cost, especially in freight-car construction. Theoretically, a device which will facilitate the movement of the truck when traversing a curve would be of advantage; but from the information obtained, it is demonstrated that the rollers, which enter into the construction of nearly all anti-friction side-bearings, soon become flattened and then the bearings are of no more value than the older design, if as good.

In concluding its report the committee desires to state that after careful investigation and inquiry among a large number of companies, it is convinced that the best results can only be obtained from a proper clearance between the side bearings. In fact, it developed that an important line was refusing cars unless there was such clearance, doubtless an evidence that it is considered a question of safety under some conditions.

This report is signed by J. W. Luttrell, Chairman; B. Haskell and H. M. Pflager.

DRAFT GEAR.

The committee gave the substance of the replies to a circular letter, the information got in this way being varied and by no means conclusive. The committee, as a whole, concurred in the following conclusion: "The ordinary type of draw gear, known as the Master Car Builders' Recommended Practice, is deficient in strength, both in method of attachment to draw timbers and in capacity of spring. The strains imposed upon this, both in pulling and buffing by heavy freight locomotives, cause frequent failures and make it an expensive draft gear to maintain."

Two members of the committee signed an appendix stating the following: "A form of draft gear, with metallic draft beams and twin springs, with draft rods running to the needle beams, is the most desirable. Malleable iron is the best material for the draft beams. Buffing timbers should be protected with suitable malleable-iron draft caps. The use of the twin springs is desirable, as it maintains the present standard yoke for coupler. The committee is not at present prepared to submit any design, but is of the opinion that a proper design should follow the lines as above stated. In conclusion, the committee would suggest that it might be desirable to make some tests to determine how much of the shock, especially of buffing strains, is absorbed by the two-coil spring and also by the tandem spring, and what is the efficiency of the various methods of attachment to the draw timbers."

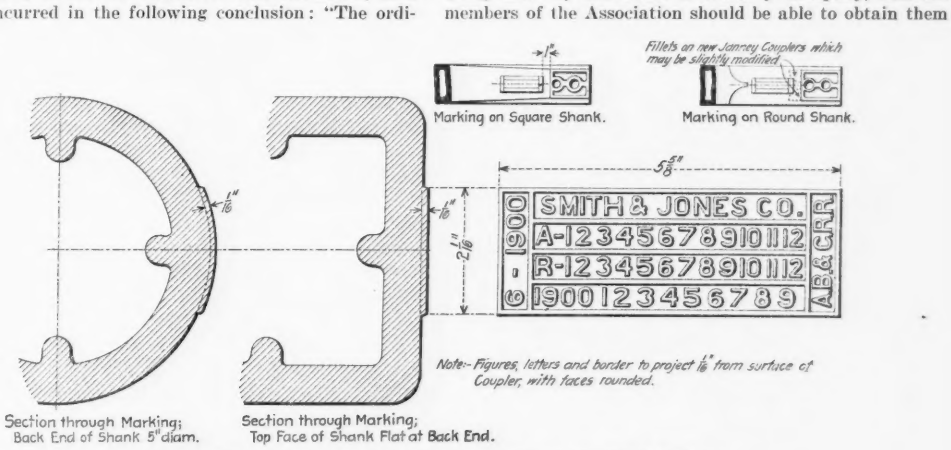
Mr. John R. Slack, the chairman of the committee, preferred a tandem arrangement of springs instead of the twin arrangement, as shown by the following appendix which he alone signed: "A form of draft gear, which is a modification of the tandem spring arrangement with malleable iron check pieces, or draft arms, bolted to the sills of the car, appears to be the most desirable form. Instead of using metal check pieces bolted to wooden draft timbers, malleable draft arms should be used bolted to the sills of the car, thus doing away with the wooden draft timbers entirely. Draft rods should be run back to the needle beams. Tandem springs should be used and arranged so as to bring them both in action in pulling and buffing. The tandem spring appears to be preferable to the twin springs side by side, as the draft arms can be brought closer together, which makes a better construction, and does not require the use of such long follower plates as the twin springs. The springs used should be the same as the Master Car Builders' standard, 6¼ x 8 in."

TESTS OF MASTER CAR BUILDERS' COUPLERS.

The committee during the last year has been largely occupied in perfecting the details of the work submitted at the last meeting of the Association, and has, therefore, been as yet unable to do any work on the more serious question, that of the tests of the Master Car Builders' couplers. The drop testing machine which has been adopted as recommended practice has now been thoroughly developed and the detail drawings were submitted with the report.

Subsequent to the last meeting of the Association, Purdue University, through Prof. R. A. Smart, with the approval of the late President Smart, and subject to the approval of its trustees, made a proposition to the committee to the effect that a drop testing machine, of the design approved, be constructed by the University at its expense, under the direction of the committee; that such machine, when built, shall be the property of Purdue University, and shall be installed in its laboratory, to be at all times subject to the use of the Master Car Builders' Association, through its proper committee, for official research, the university to furnish such aid and assistance and subsidiary apparatus as may be convenient; the machine to be at all times usable by Purdue University for educational and commercial purposes; all of the above to apply to any improvements in the machine which may be devised by your committee. The committee submitted the proposition to the executive committee and was by it empowered to act in the matter, and has, therefore, believing the proposition to be exceedingly fair, taken it up with Purdue University and is now awaiting advice of the favorable action by the trustees of that institution. The committee hopes that before the next meeting of the Association this drop testing machine will be constructed and in operation and some definite results obtained.

The secretary of the Association was authorized, and has arranged with the Pratt & Whitney Company, of Hartford, Conn., to make the worn coupler gage, and the committee is advised that at the present time 241 of these gages are under process of construction. The coupler contour gage, which was somewhat modified, with the approval of the Association at its last meeting, is now being made by the Pratt & Whitney Company, and the members of the Association should be able to obtain them


Fillets on new Janney Couplers which may be slightly modified.
Marking on Square Shank.
Marking on Round Shank.
5 5/8"
1/16"
1/16"
2 1/8"
1900
SMITH & JONES CO.
A-1 2 3 4 5 6 7 8 9 10 11 12
R-1 2 3 4 5 6 7 8 9 10 11 12
1900 1 2 3 4 5 6 7 8 9
A B & C R R
Note:- Figures, letters and border to project 1/16" from surface of Coupler, with faces rounded.
Section through Marking; Back End of Shank 5" diam.
Section through Marking; Top Face of Shank Flat at Back End.

Recommended Marking of Couplers Bought On Time Specifications.

on order. The twist gage, as approved as "recommended practice" at the last meeting of the Association, has been in use experimentally by the committee for some little time, and some slight changes and modifications have been found necessary. The committee does not feel warranted, as yet, in placing this gage in the hands of a manufacturer, as there is a possibility that a more extended trial will demonstrate that some further changes may be required.

In view of the fact that some couplers are bought on time specifications, it has been suggested that a method of marking similar to that now in general use on air-brake hose be adopted for couplers. The committee submits as its recommendation for this purpose, the method outlined on the attached drawing. This arrangement can be followed exactly on a large number of couplers, but, unfortunately, on some the design of the shank is such that some rearrangement will be necessary. These isolated cases will have to be treated as they may be brought to the attention of the committee. In the event of the proposed method meeting the approval of the Association, the committee would further recommend that it be embodied in the specifications.

The committee has given considerable thought to increased dimensions of the coupler shank, but is not at present prepared to recommend an increase, in view of the fact that such radical changes as the committee would desire to make will necessitate very material changes in such standards of the Association as pertain to the spacing of center sills, location and dimensions of draft timbers, etc. It is possible that the development of the metal center-sill or metal draft-timber may bring about such a design of these parts as will permit the use

of a coupler with an increased shank. Before this matter can be definitely settled it may require a joint meeting of the standing committee on couplers and the committee on draft gear.

As the interstate commerce law in regard to the use of automatic couplers becomes operative on Aug. 1, 1900, the necessity for the link and pin disappears. The committee, believing, therefore, that the time for the abandonment of the link-pin hole and slot is now at hand, hereby ask for such discussion of the subject as will enable the committee to intelligently make its recommendations.

This report is signed by W. W. Atterbury, Chairman; W. S. Morris, W. P. Appleyard, H. Monkhouse and F. A. Delano.

Exhibits at the Conventions.

The following is a complete list of the exhibits in place at the Saratoga Conventions at the time of going to press:

Acme Railway Equipment Co., Easton, Pa.—Full size models of the Acme automatic M. C. B. car coupler and Acme buffer platform, fitted with the McKeen carry iron.

Adams & Westlake Co., Chicago, has one of the most interesting exhibits in car lighting; a structure representing a full size interior of a passenger car was lighted by the "Adlake" acetylene gas system. The car is fitted with seven chandeliers, each with four burners.

American Balance Slide Valve Co., Jersey Shore, Pa.—Samples of the American balanced slide valves for locomotives; marine valves, air engine valves, and a new piston valve recently put on the market. A part of the exhibit consists of a large number of photographs, showing how extensively the valves have been applied to engines.

American Brake Shoe Co., Chicago, Ill.—Models of brake shoes.

American Brake Co., St. Louis, Mo.—Quarter-sized model car brake, showing automatic slack adjuster.

American Car & Foundry Co., St. Louis, Mo.—Three cars are exhibited on the railroad tracks, near the hotels. Two of these are wooden cars, built according to the designs of Mr. Canda, which were fully illustrated in the Railroad Gazette at the time of the 1899 convention. The box car is 39 ft. 5 in. long inside, and has a carrying capacity of 100,000 lbs., and a light weight of 32,200 lbs. The wooden hopper bottom coal car is of similar capacity, and empty weighs 32,600 lbs. Both have Canda metal trucks. A new hopper-bottom coal and ore car built entirely of steel is also shown for the first time. The framing of this car is different from that used up to this time, and lattice construction is used for the side sills. It is of 110,000 lbs. capacity, and has a light weight of 38,500 lbs. The length inside is 32 ft., and the width 9 ft., the height of the sides above the rail is 11 ft. 7⅝ in., and the sides, ends and floors are ¼-in. steel plates. Rolled shapes are used throughout, excepting that the end sills, bolsters and draft lugs are cast steel.

American Carbide Lamp Co., Philadelphia, Pa.—The system of lighting by carbide is shown by this company in a car of the Boston & Albany Railroad on the tracks of the Delaware & Hudson.

American Coupler Co., Chester, Pa.—One full-size model of the American all-steel M. C. B. car coupler. Six American couplers were shown also in connection with the exhibit of the Dayton Malleable Iron Co.

American Dust Guard Co., Columbus, O.—Dust guards for journal boxes.

American Locomotive Sander Co., Philadelphia, Pa.—Full size working model of the Leach pneumatic sanding device for locomotives.

American Machinery Co., Grand Rapids, Mich.—Oliver wood trimmers, three sizes, 0, 3 and 6.

American Steam Gauge Co., Jamaica Plain, Mass.—Six full-size locomotive steam and air-brake gages, and three gages with the faces removed to show the working parts. The company also shows several of its pop valves.

American Steel Foundry Co., St. Louis, Mo.—Models of steel trucks and body bolsters.

Armstrong Bros. Tool Co., Chicago, Ill.—Complete line of planer and machine shop tools.

Atlantic Brass Co., New York.—Samples of the A B C journal bearing.

Atlas Railway Supply Co., Chicago.—Atlas primer and Atlas surfacer, made under the Thomas S. Vaughan formulas for passenger cars and locomotives; I. X. L. composition for all kinds of iron and wood work.

Automatic Air & Steam Coupler Co., St. Louis, Mo.—Automatic air, steam and signal coupler.

Automatic Track Sanding Co., Boston, Mass.—Full size working model and parts of the automatic pneumatic track sander made by the company.

Ball Bearing Co., Boston, Mass.—Full line of ball and roller bearings for all kinds of machine construction, shafting and vehicles.

Baltimore Ball Bearing Co., Baltimore, Md.—Samples of the Norwood ball side bearing.

Bierbaum & Merrick Metal Co., Buffalo, N. Y.—Samples of Lumen bronze for car bearings and side rods and locomotive driving box brasses.

F. W. Bird & Son, E. Walpole, Mass., and Chicago, Ill.—Full size model of the Torsion proof car roof, showing application in detail.

R. Bliss Mfg. Co., Pawtucket, R. I.—Full size working models of the Wood patent car gate as used on the New York, New Haven & Hartford and other roads; also the Crone automatic air gate for steam and elevated cars, connected to show method of working.

Boston Artificial Leather Co., New York.—Two car seats upholstered with Morocceline. Also a well displayed lot of samples of Morocceline for head linings and upholstery purposes, including a number of pieces of goods of new grains and colors.

Boston Belting Co., Boston, Mass.—The exhibit of this company was delayed in transit, and was not in place until Tuesday. It consists of a large number of samples of the rubber goods for railroad use, including hose for water, steam and air; several varieties of packing; and gaskets, valves, diaphragms, mats, matting and treads.

Bradley Co., Syracuse, N. Y.—Models of Bradley hammers and forges.

Butler Draw Bar Attachment Co., Cleveland, O.—Double spring tandem draft attachments, suitabe for any style of construction.

Carborundum Co., Niagara Falls, N. Y.—The exhibit of this company is unusually complete, showing the product of the company from the ingredients to the finished material. The initial process is represented by two models of the walls and interior of the furnace used in making Carborundum, the first showing the raw materials and core, and the second the crude Carborundum as it appears in the furnace just before its removal. The large display of finished articles includes a pyramid of specimens of Carborundum wheels from the smallest (for dental purposes) to those 36 in. in diameter. The exhibit includes also slips and stones of many sizes and shapes, and two full size Yankee twist drill grinders fitted with Carborundum wheels.

Carse Brothers Co., Chicago, Ill.—High speed machine bits for machines and pneumatic tools.

L. C. Chase & Co., Boston, Mass.—The company makes its usual fine display of the well-known Chase mohair plush, made by the Sanford mills, and in addition shows for the first time a full line of the new Chase leather for upholstering seats for smoking and suburban cars and for car curtains and decorations. The leather also is made by the Sanford mills.

Chicago Grain Door Co., Chicago, Ill.—Full-size Chicago grain door; security and lock brackets.

Chicago Pneumatic Tool Co., Chicago, Ill.—The exhibit of this company was the largest it has ever made, doubtless due to the remarkable growth of the pneumatic tool business and the well-known enterprise of that concern. This exhibit was the more valuable as, in addition to having tools which could be examined and if need be taken apart, they were shown actually doing work. It was an interesting and instructive place, and was crowded at all times. The following is a list of the tools: Chicago reversible drills in five different sizes; Boyer drills in two sizes, and numbers of Whitelaw drills for different classes of boring and drilling, used both with and without breast plates; a 10-h.p. compressed air reversible motor for operating turntables similar to those now in use on the Erie and Pennsylvania R. R.; Boyer pneumatic hammers of various sizes, the largest being used for riveting, the medium size for chipping and caulking, and the smallest for carving stone and marble; Boyer long stroke hand hammers for heavy field riveting on bridge and other structural work, capable of driving 1¼-in. rivets; Boyer yoke riveters; pneumatic holder-on; a special rigging for driving the shell and deck rivets of vessels whereby one laborer can do the work of four skilled men; Boyer speed recorders; a pneumatic sand rammer used in foundries, making large molds, which tool takes the place of from 10 to 12 men; Chicago pneumatic painting machines; Chicago rivet heating oil furnace, capable of heating 6,000 rivets a day with 12 gallons of crude oil; Chicago stay bolt biters and stay bolt chucks; Ford dolly bars; flue welding machine, it being a very compact machine for reducing and welding locomotive flues in boiler shops; improved flue rollers and cutters operated by air motors and various styles of air hoists. As stated, these tools were shown in their respective operations of riveting, chipping, drilling and boring, etc., and flue and stay bolt work was shown on sections of fireboxes and tube sheets.

Chicago Railway Equipment Co., Chicago, Ill.—Automatic frictionless side bearings; National Hollow, Kewanee, Diamond and Central brake beams for passenger and freight cars.

John R. Clancy, Syracuse, N. Y.—Samples of the Clancy wrought steel hose clamp, in which the clamp, bolt and nut have been made non-rusting by an electro-galvanizing process.

Cleveland City Forge & Iron Co., Cleveland, O.—Pressed wrought iron open turn-buckles and car forgings; also the largest turn-buckle ever made, weighing 750 lbs.

Cloud Steel Truck Co., Chicago, Ill.—Bettendorf I-beam body and truck bolsters. Cloud steel trucks and pressed steel shapes used with bolsters.

Consolidated Car Heating Co., Albany, N. Y.—A car equipment of hot water heating, with the improved drum system, is shown on a raised platform 60 ft. x 10 ft. The piping is fitted with thermometers to indicate the temperatures of the circulating water. Glass tubes have been substituted for the pipe connecting the heating drum to the expansion drum, to show the formation of steam bubbles and the way in which the bubbles in the Baker heater system cause circulation. Long glass tubes are connected with this exhibit, so that the amount of water head which carries the circulation can be clearly seen. The same system is also shown as applied to a double circuit water heater. A complete five-car train equipment is represented by short sections of pipe fitted with end valves, traps, etc. The exhibit includes a full line of electric heaters, in which the regulation of heat is illustrated by lamps, and the effects made visible, and electric switches.

Consolidated Railway Electric Lighting & Equipment Co., New York.—The principal exhibit of the company consisted of the private cars of Mr. E. Van Etten, General Superintendent of the New York Central & Hudson River, and Mr. August Belmont, Chairman of the Board of Directors of the Louisville & Nashville. On invitation of Mr. John N. Abbott, Vice-President and General Manager of the Consolidated Company, parties of railroad officials were taken in these cars during the evenings for short runs over the Delaware & Hudson road, and were thus enabled to see the electric axle lighting and ventilating system of the company under service conditions. In addition the company exhibited a full size model of its lighting system and a one-quarter size passenger car truck showing the method of suspending the dynamo to the axle. This apparatus was illustrated in our issue of June 15.

L. N. Cox & Co., New York.—Renewable valve stem sleeve; shop and hand torches and the Safety M. C. B. car coupler.

S. A. Crone, New York.—Model of the Crone patent dust guard.

Crosby Steam Gage & Valve Co., Boston, Mass.—Crosby muffled and plain pop valves, chime whistles and waterback locomotive gages; Johnstone blow-off valves, and Crosby spring-seat globe and angle valves.

Curran & Burton, Boston, Mass.—Full size models of the Huff patent track sanding device, automatic steam blower and auxiliary variable exhaust.

Curtain Supply Co., Chicago, Ill.—The Burrows and Forsyth "roller tip" and Acme and Climax "cable" car curtains and fixtures.

E. M. Dart Mfg. Co., Providence, R. I.—Samples of the Dart union couplings and flanges.

Dayton Malleable Iron Co., Dayton, O.—The Dayton draft rigging with malleable draft sill, full size; different types of car door fastenings; two styles of shop and engine torches; malleable brake wheels; brake levers; lubricating center plates.

Frank S. De Ronde Co., New York.—Samples showing the application of Lythite cold water paint. Also full size models of a pneumatic painting machine.

Detroit Lubricator Co., Detroit, Mich.—Full size models of the new '99 Detroit sight feed lubricator, with tippet attachment and by-pass valve for auxiliary oiling.

H. K. Doolittle, Watertown, N. Y.—Model of a patent car window.

Drexel Railway Supply Co., Chicago, Ill.—The Schroeder grain door; the Cardwell brake shoe.

Dunlap & Plum, Columbus, O.—The U. & W. piston air drill.

O. M. Edwards, Syracuse, N. Y.—Several models showing full size car windows fitted with the Edwards device for opening by pinch handles, as used on the Pennsylvania Railroad.

Fairbanks Co., New York.—Nicholson compression couplings and adjustable lathe mandrels; Merrell pipe threading and cutting machine; Oster stocks, dies and screw plates; Dart unions and flanges; double wire rope; Walker magnetic chucks; valves; vulcabeston packing and pneumatic hammers.

Fox Machine Co., Grand Rapids, Mich.—Wood trimming machine.

Garry Iron & Steel Roofing Co., Cleveland, O.—Garry pneumatic crane and pneumatic car jack.

Gaskins Coupler Co., Arcadia, Fla.—Two full size models of the Gaskin coupler, mounted on trucks to show working on curves.

Gem Mfg. Co., Pittsburgh, Pa.—Samples of the Gem oiler for railroad use.

Gold Car Heating Co., New York.—The exhibit of this company represents a complete car and locomotive equipment. The piping is arranged full size, the same as when applied to a regular 50 ft. coach. One side is shown fitted with Gold's duplex, double coil, sealed jet system of hot water circulation, and the other with Gold's plain pipe or direct steam system. All of the Gold specialties used extensively by the railroads of the world for car heating purposes are also exhibited, and considerable interest in the Gold electric heater, especially the samples showing the type recently adopted by the Boston Elevated, is shown.

Goodwin Car Co., New York.—Model of the Goodwin dump car. The company shows its method of dumping the Goodwin car, as employed by various roads which lease these cars, by photographs, and illustrates plainly the saving in time and labor over other methods of handling stones, ballast, dirt, etc.

Gould coupler Co., New York.—Models of sections of cars showing the Gould improved malleable iron draft gear for freight cars, and the Gould improved steel passenger car platform with continuous buffer, M. C. B. coupler, vestibule and vestibule trap door; also full size working models of the Gould passenger and freight car brake slack adjusters, and the Gould M. C. B. journal box. The models were exceptionally well made and attractive.

William Hall & Co., Boston, Mass.—Samples of the Marden patent bell cord hanger.

Hale & Kilburn, Philadelphia, Pa.—A pressed steel Walkover car seat and a reversible back seat of the same material, showing single automatic foot rail designed to permit placing baggage under the seat and to facilitate cleaning the car floor.

M. C. Hammet, Troy, N. Y.—Full size working model of the Sansom pneumatic bell ringer for locomotives.

Harrison Dust Guard Co., Toledo, O.—Dust guards for 40,000, 60,000, 80,000 and 100,000 lb. capacity cars.

Heywood Bros. & Wakefield Co., Wakefield, Mass.—Reed parlor car chairs and samples of the Walkover and reversible styles of car seats with movable foot rests.

Homestead Valve Mfg. Co., Pittsburgh, Pa.—Full size model of the Homestead locomotive blow-off valve.

Illinois Malleable Iron Co., Chicago, Ill.—The "Bruyn" automatic swinging smoke jack.

International Correspondence Schools, Scranton, Pa.—Air brake instruction, car No. 104 shown on the D. & H. tracks.

Jenkins Bros., New York.—A full line of valves, including globe, angle, cross, check, Y or blow-off, safety, back pressure, corner, and gate and automatic air valves; Jenkins' Standard '96 and valve stem packings; union rings; gaskets; washers; discs; gage cocks and full-size models of the Seller's restarting injector.

H. W. Johns Mfg. Co., New York.—A complete line of samples of asbestos goods, including fire-felt covering for steam pipes, sheet fire-felt, locomotive lagging, wick packing; Kearsarge asbesto-metallic packings and gaskets, and vulcabeston molded and pressed rope gaskets and molded rings and union washers. A model of a locomotive boiler is shown to illustrate the method of applying asbestos lagging.

The Joyce, Cridland Co., Dayton, O.—Railroad jacks; hydraulic jacks; geared jacks; improved single lever and screw jacks.

Philip S. Justice & Co., Philadelphia, Pa.—Reliance hydraulic journal, ground lift and broad base jacks.

M. E. Kanaly Co., Cambridgeport, Mass.—Model of a freight car door with the Kanaly door hanger and seal lock attached.

Keasbey & Mattison Co., Ambler, Pa.—Large display of magnesia boiler lagging and train pipe covering and asbestos packing, wicking, threads and cloth.

Keystone Drop Forge Works, Philadelphia, Pa.—Large number of samples of the Keystone connecting link.

Knitted Mattress Co., Canton Junction, Mass.—Two car seats upholstered in plush and Pegamoid, the seats and backs being filled with knitted elastic padding. Also samples of knit padding for cab and caboose cushions and table padding for dining cars.

Ko-Ko Cream Co., New York.—Samples of Ko-Ko Cream for cleaning and polishing the varnished surfaces of passenger cars. The method of applying and the result is shown by applying the liquid to some polished boards that were stained in actual service as parts of coaches.

Lappin Brake Shoe Co., New York.—Samples of Lappin brake shoes for cars, with and without the Robischung patent steel back; also the Lappin shoe, with malleable iron back, for locomotive driving wheels. The company has brought out a new brake shoe, the Interlocking, a divided brake shoe arranged so that a shoe worn to the ordinary limit of wear can be instantly applied to the face of a new shoe and held securely until worn completely.

Leach & Simpson, Chicago, Ill.—The Ferguson locomotive fire kindler.

Lunkenheimer Co., Cincinnati, O.—The Lunkenheimer '99 model standard injectors; globe valves and swing check valves.

Manhattan Rubber Mfg. Co., New York.—A full line of rubber specialties, including hose, packing, washers, gaskets, ball valves, tiling, mats, tubing and vulcanized rubber emery wheels. The exhibit is decorated with plants from Central America.

Manning, Maxwell & Moore, New York.—The exhibit of this company is composed of articles made by the Hayden & Derby Mfg. Co., Ashcroft Mfg. Co., and Hancock Inspirator Co., and includes several patterns of Metropolitan injectors, a water heater, two hose strainers, and check valves, in sectional form, to show method of working; muffler and open pop valves; No. 10 Hancock inspirator, with 2½-in. suction pipe; Hancock Composite inspirator (double delivery), single screw boiler check; duplex boiler check, with inside stop valve; Ashcroft steam gage, and three Hancock main steam valves.

McCord & Co., Chicago.—Johnson hopper door; McCord journal box; McCord spring dampeners and Torrey anti-friction metals.

Michigan Lubricator Co., Detroit, Mich.—Improved Michigan triple and double sight feed locomotive lubricators and automatic steam chest plugs; also Nos. A, B and C air pump lubricators.

Monarch Brake Beam Co., Detroit, Mich.—"Monarch" and "Solid" brake beams.

Moran Flexible Steam Joint Co., Louisville, Ky.—Large joints and all metal steam-heat couplings.

Thornton N. Motley Co., New York.—The Symons automatic emergency recorder, shown working in connection with the exhibit of the Chicago Pneumatic Tool Co. Also samples of the Johnstone Flexible staybolt.

National Car Coupler Co., Chicago.—Full size combination M. C. B. and Miller passenger coupler and model showing new steel platform; also Hinson draw-bar attachment, full size.

National Elastic Nut Co., Milwaukee, Wis.—Elastic self-locking steel nuts.

National Lock Washer Co., Newark, N. J.—Models of car windows fitted with the new National sash lock.

National Malleable Castings Co., Cleveland, O.—Stevenson malleable iron journal box and lid; and models of "Tower" coupler.

National Railway Specialty Co., Chicago, Ill.—Models of Security, Dunham and Q. & C. trolley doors; N. R. S. adjustable journal bearing wedge; Ryan dust guard.

New York Air Compressor Co., New York.—This exhibit is made in connection with that of the Chicago Pneumatic Tool Company, and two compressors are shown running, air being supplied to work the large assortment of pneumatic tools. One is a duplex compressor with a capacity of 200 cu. ft. of air per minute, which, with 65 lbs. steam pressure, will deliver air at 115 lbs. The compressor is a new model, and the chief features are that the valves are very accessible; the whole construction is unusually heavy and large wearing surfaces are provided. The other is a straight line compressor, with a capacity of 100 cu. ft. a minute.

New York Leather & Paint Co., New York.—Full line of samples of Pegamoid for upholstering car seats and backs and for headlinings and curtains for cars.

A. O. Norton, Boston, Mass.—Samples of the Norton 50-ton bridge jack; ball-bearing traversing jack "C"; 25-ton car jack; and 10 and 15-ton journal jacks.

Pantasote Company, New York.—Section of a car showing curtains and headlinings of and seats upholstered with Pantasote. The seats and backs had panels done in gilt relief, the combination giving a pretty effect. The car was lighted with the Adams and Westlake acetylene gas system.

Pearson Jack Co., Boston, Mass.—The Pearson car replacing jack, Goodwin brake beam clamp and Pearson king bolt clamp.

Peerless Rubber Mfg. Co., New York.—A full line of rubber goods, including Peerless air and steam hose, packing; belting, matting and tiling. In the exhibit is a large roll of the well-known Rainbow packing, especially adapted for very high pressure.

Penberthy Injector Co., Detroit, Mich.—Erwin steam ram and method of operating.

Philadelphia Pneumatic Tool Co., Philadelphia, Pa.—A complete line of pneumatic appliances, including flue cutters and rollers, breast drills, chipping, riveting and calking hammers, yoke riveters, chain hoists, foundry rammers and piston and rotary drills.

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.—Samples of steel emery of different sizes for grinding purposes.

Pneumatic Crane Co., Pittsburgh, Pa.—Full size working model of a self-propelling air hoist, fitted with one of the company's patent reversing air motors.

Powers Regulator Co., Chicago.—Automatic regulator for controlling the temperature of passenger cars, office buildings and residences.

Pressed Steel Car Co., Pittsburgh, Pa.—This company has on the tracks of the D. & H., near the station, five all-steel cars, which forms an interesting exhibit of modern practice. A new Erie R. R. pressed steel hopper bottom gondola car is shown which has a capacity of 100,000 lbs. and a light weight of 36,750 lbs. In this car the sills are of fairly light, channel section, of a uniform depth throughout, which is made possible by bringing the side plates and outside steel stakes down alongside the sills, flanging under and riveting them to the lower flanges of the side sills; in effect the whole side becomes a deep girder. Pressed steel diamond frame trucks are used, as well as 5½ in. x 10 in. journals, M. C. B. couplers, and pocket attachments, Westinghouse air-brakes and pressed steel brake beams. The second car shown is a similar Pennsylvania R. R. hopper bottom gondola. The

capacity is the same, but the light weight is 39,900 lbs., the increased weight being largely due to a difference in the side construction. In this car the side sills are heavier, and have a greater depth at the middle, the side plates being turned over and riveted to the top flanges of the side sills. This car is fitted with M. C. B. couplers, Westinghouse air-brakes, and pressed steel diamond frame trucks, with 5½ in. x 10 in. journals. The third car is a New York Central flat, with pressed steel under-frame and wood floor. This car is 40 ft. long, has a capacity of 80,000 lbs., and a light weight of 28,000 lbs. Fox pressed steel trucks are used, New York air-brakes, National-Hollow brake beams, and Gould couplers, and spring buffers. The fourth car is an all-steel flat bottom coal car, with four flush doors in the floor, built for the Chicago & Alton. The length inside is 41 ft. 9 in., the carrying capacity is 100,000 lbs., and the light weight is 35,600 lbs. As in the Erie car, first described, the sides sheets and stakes are turned under, and are riveted to the lower flanges of the side sills. Pressed steel diamond frame trucks are used. Universal bearings, Janney couplers, Miner draft gear and New York air-brakes. This kind of car has been found very useful in and about Chicago, as the floor arrangement permits of the car being unloaded either by shoveling or by dumping. Often with the usual styles of coal cars, it is not known at the mines how the car is to be unloaded, and delays often occur through shipping coal in bopper bottom cars where the unloading has to be done with shovels, and vice versa. The fifth is a 100,000-lb. capacity steel ore car of the Great Northern, of the hopper bottom type. The length is about 20 ft. over all, and the light weight is 29,000 lbs. The sides of this car are like those of the Pennsylvania car, being riveted to the top flanges of the side sills; the sills are of channel section, with a greater depth at the middle than at the ends. Pressed steel diamond frame trucks are used. The Pressed Steel Car Company also shows a complete truck frame of a "Buckeye" truck, built entirely of pressed steel shapes.

Pyle National Head Light Co., Chicago, exhibits a number of photographs showing the effect of the electric headlight on the track.

Railroad Supply Co., Chicago.—Hien one-piece draft rigging; Wegg, Hien, Detroit and Solid couplers, and coupler having the Hien head and Potter shank.

Railway Appliance Co., Chicago, Ill.—Gilman-Brown emergency knuckle.

Rand Drill Co., New York.—A 10-in. x 14 in. straight line compressor, with combined air governor and regulator, is shown in operation. The compressor furnishes the air for all exhibits requiring this power, excepting the Chicago Pneumatic Tool Co.

R. W. Randle, Richmond, Ind.—The Swihart mail crane, model.

Roberts Car Wheel Co., Three Rivers, Mich.—Donovan pressed steel wheel, without rivets or bolts; also the emergency air-brake hose clamp.

H. Sabine, Cambridge, Mass.—Full size model of the Sabine automatic M. C. B. coupler and a Janney coupler fitted with Mr. Sabine's ball-bearing system.

Safety Car Heating & Lighting Co., New York.—The exhibit of this company is located in the corridor of the Grand Union Hotel, and is very attractive. It includes the recent advances made in Pintsch equipment, illustrating new designs of gas and combination gas and electric center lamps and bracket lamps for all classes of cars. Also special fixtures for dining cars. The company has samples of its steam heating appliances, and a model of its complete water circulating system. As an object of interest, the company shows a storm proof sea lantern, such as is used on floating buoys and stationary beacons, which automatically gives intervals of ten seconds' light.

Schenectady Locomotive Works, Schenectady, N. Y.—This company shows on the railroad tracks near the hotel one of the new Chicago & Northwestern passenger locomotives, briefly described in our issue of June 15. Also, a mogul freight locomotive, which is one of 40 now building for the New York Central & Hudson River. The principal dimensions of this engine are as follows: Cylinders, 20 in. x 28 in.; driving wheels, 57 in.; boiler pressure, 190 lbs.; weight on drivers, 135,500 lbs.; total weight in working order, 155,200 lbs.; extended wagon top boiler; tube heating surface, 2,322 sq. ft.; fire-box heating surface, 186 sq. ft.; total heating surface, 2,508 sq. ft., and grate area, 30.3 sq. ft.

William Sellers & Co., Incorp., Philadelphia, Pa.—Main check and angle steam valves and full size models of the Sellers' self-acting injector.

Shelby Steel Tube Co., Cleveland, O.—A miniature locomotive on track made entirely of Shelby steel tubing; samples and test pieces of seamless steel boiler tubes bent in various shapes, and samples of seamless steel boiler tube welded to lap welded charcoal iron boiler tubes.

Sherwin-Williams Co., Cleveland, O.—Large signs, showing colors of its railroad paints.

Simplex Railway Appliance Co., Chicago, Ill.—Simplex body and truck bolsters for 60,000-lb. and 80,000-lb. capacity cars; also Susemihl frictionless roller side bearing.

Smillie Coupler & Mfg. Co., Newark, N. J.—Full size models of the Smillie freight coupler and Smillie tender coupler.

Spiral Nut-Lock Co., New York.—Samples of the Spiral nut lock, a graduated circle of specially rolled crucible steel wire that follows the nut on the bolt, locking the nut.

Standard Coupler Co., New York.—Full size model of the Standard steel platform.

Standard Paint Co., New York.—Model of a section of a freight car fitted with Ruberoid car roofing and P. & B. waterproof insulating paper. Also samples of the several other P. & B. products.

Standard Pneumatic Tool Co., Chicago, Ill.—Pneumatic tools as follows: Four reversible machines for flue rolling, reaming and tapping; four reversible machines for wood boring; a full set of hammers; riveter; breast drill; engineers' release valve and blow-off cock; air hoists, etc.

Standard Railway Equipment Co., St. Louis, Mo.—Exhibit in room 422 different kinds of the "Monarch" pneumatic tools.

Star Brass Mfg. Co., Boston, Mass.—Full line of locomotive trimmings, including open pop and muffled safety valves, automatic water gages, chime whistles, and non-corrosive gages.

Sterlingworth Railway Supply Co., Easton, Pa.—This company, in addition to its rolled steel brake beams, car bolsters and rolled steel truck, exhibits an all-steel hopper bottom coal car built of rolled shapes, which attracted much attention and received much favorable comment. The car was built under the patents of Messrs. Dingertz and Coolbaugh, and has King hopper doors. The carrying capacity is 80,000 lbs., and the light weight is 29,500 lbs. The longitudinal sills are I beams, and the sides are steel channels placed one above the other, and riveted through the flanges; the end sills and corner connections are heavy malleable iron castings. The whole construction appears heavy, and yet the light weight is not more than that of many steel cars of the same capacity. With this car is used Sterlingworth rolled steed trucks and brake beams, Acme reinforced shank couplers, and McCord journal boxes. This car is illustrated elsewhere in this issue.

Thornburgh Coupler Attachment Co., Detroit, Mich.—Coupler attachments for single, twin and triple springs, with or without metal draft arms, adapted to any construction.

United & Globe Mfg. Co., Trenton, N. J.—Samples of rubber hose and other specialties for railroad service.

Universal Car Bearing Co., Chicago, Ill.—Journal bearings and wedges.

Universal Railway Supply Co., Chicago, Ill.—Universal car door.

Walworth Mfg. Co., Boston, Mass.—A full line of specialties, including stocks and dies, steam whistles, pipe cutters, ratchet drills, wrenches and vises, and Smith's ratchet track drill.

Waterbury Tool Co., Waterbury, Conn.—Samples of the Williams universal ratchet for drilling holes in close places where no other ratchet will work for lack of room for the handle to move. The company also shows the Rivett-Dock tool for thread cutting, and the Simplex lathe center grinder, for which devices the company is agent.

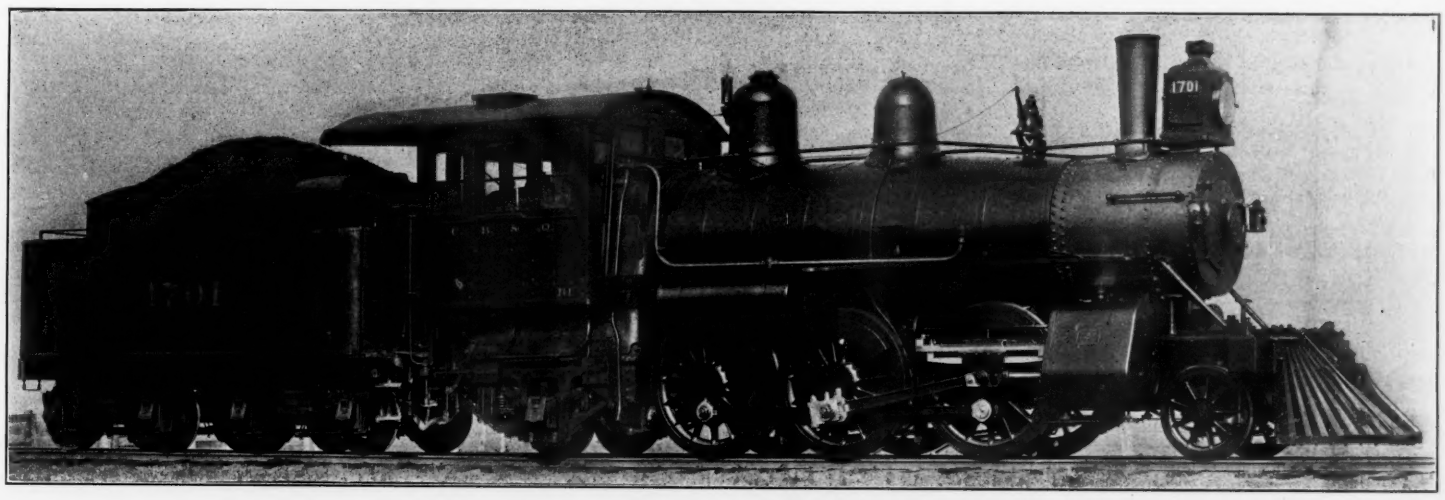
West Disinfecting Co., New York.—Samples of disinfectants and disinfecting appliances.

Western Railway Equipment Co., St. Louis.—Combination lug and follower casting, Economy slack adjuster, tandem combination lug and follower, sill and carline pocket, bell ringer, Western flush door, interchangeable door, safety and security truck and casting, the Mudd sander, the Lindstrom non-freezing suction pipe, St. Louis flush door, Acme pipe clamps, Downing card holder, Acme tender pocket, lugless draft beam, side bearings.

J. H. Williams & Co., Brooklyn, N. Y.—A large number of special drop forgings, including wrenches of several designs, lathe dogs, crank handles, hooks, eyebolts, crank shafts and thumb screws and nuts. Several sizes of the Vulcan drop forged chain pipe wrench are shown also.

Woven Steel Hose & Cable Co., Trenton, N. J.—Samples of Protector hose. This hose is covered with woven steel, and is especially adapted for conducting air, steam or water at high pressures.

William Yerdon, Fort Plain, N. Y.—Samples of the Yerdon hose bands.



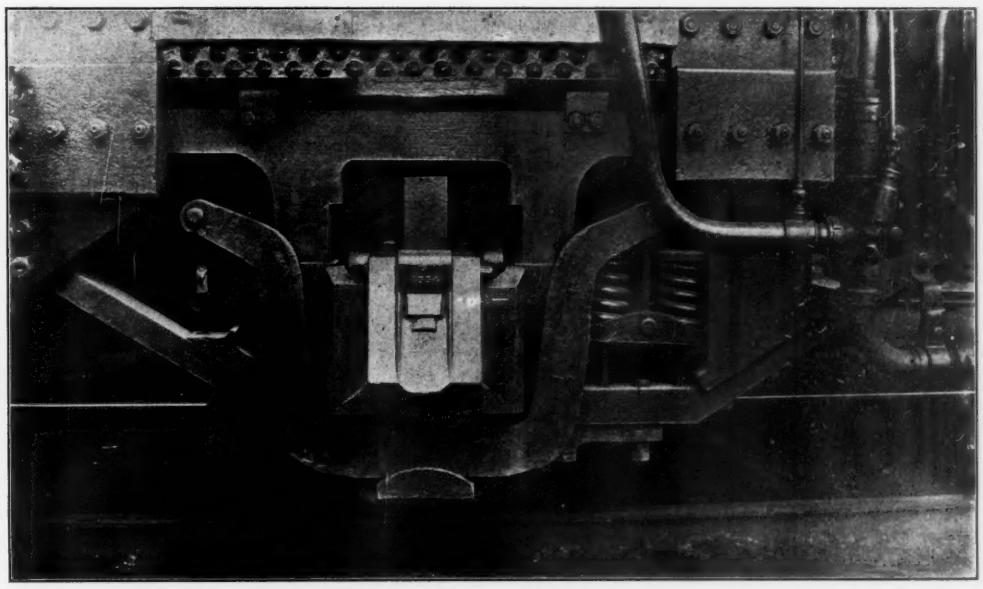
New Class R "Prairie Type" Locomotive—Chicago, Burlington & Quincy R. R.

Foreign Railroad Notes.

After scouring the world for locomotives, the management of the Belgian State Railroads, has succeeded in contracting for 158 to be delivered before the close of this year. Works in Belgium, Germany, Austria and America have taken contracts. Belgium formerly exported many locomotives.

All aboard for the Pyramids! This is what you may hear, possibly in several languages, in Cairo nowadays. A company of Germans and Belgians has built a trolley line from the bridge at Cairo following the Nile some two miles and thence five miles directly to the Pyramids, so that Donkey's occupation is gone. One Westinghouse motor car and two trailing cars, with an Arab motorman and conductor, take the place of many donkeys and donkey-drivers. But what do the Pharoahs think?

This being the year of Jubilee, there will be an important passenger traffic from all European Catholic countries to Rome, and it is largely provided for by special trains at very low rates. The Bavarian railroads sell tickets for parties of thirty persons at half price. Special trains are provided for parties of 200 or more. The tickets are given only to the conductor of the pilgrimage and not to the separate pilgrims, who thus are compelled to keep together. The journey may be broken once in either direction, but only by the party as a whole. The first pilgrim train for Rome left Bavaria early in May.



Trailing Truck Journal Boxes of "Prairie Type" Locomotive.

"Prairie" Type Freight Locomotives of the Chicago, Burlington & Quincy.

In our issue of March 30 last, the drawings of the new "Prairie" type freight locomotives of the Chicago, Burlington & Quincy were published, together with a very full description of the novel features. These engines are for fast freight service on a fairly level road and have attracted much attention. They represent a successful attempt to design a sufficiently wide fire box for bituminous coal, and at the same time the cab is so placed that the engineman and fireman are together. Since our first publication these locomotives have been put in service and the engravings are from photographs of the completed engines, furnished by Mr. Delano. The notable features may be briefly stated.

There are three pairs of driving wheels and a single pair of leading and trailing wheels; the middle drivers have plain tires. The trailing axle has outside bearings, as clearly shown in the engravings, and this promises to be used in future designs as the journals and boxes are removed from the heat and dirt of the ash pan, a steadier riding engine is obtained and the journals can be readily inspected. The

boiler is of the Belpaire type with the water legs sloping outward beyond the lines of the main frames; the use of trailing wheels also permits of a deep fire box. The boiler, valve motion, piston valves and other details were illustrated March 30. The principal dimensions are:

Cylinders, size	19 x 24 in.
Driving wheels, diameter	64 in.
Working steam pressure	190 lbs.
Total weight	140,000 lbs.
Weight on drivers	96,000 lbs.
Heating surface, firebox	139 sq. ft.
Heating surface, tubes	1,937 sq. ft.
Heating surface, total	2,076 sq. ft.
Grate area	42 sq. ft.
Firebox, length	7 ft.
Firebox, width	6 ft.
Firebox, depth, front	62¼ in.
Firebox, depth, back	56 in.
Tubes, number	194
Tubes, diameter	2¼ in.
Tubes, length	16 ft. 1 in.
Tender, water capacity	5,000 gallons
Tender, coal, capacity	8 tons

Combination Flat and Hopper-Bottom Box Car—Baltimore & Ohio.

Mr. W. T. Manning, Consulting Engineer of the Baltimore & Ohio, has recently patented a combination flat and hopper-bottom box car, and a sample car of this kind, like the accompanying engravings, is now building at the Mt. Clare shops of that road. A good many combination cars have been designed in the past, and some have been built, but these cars have usually proved failures because their designers tried to accomplish too much and were thus led into complications of construction. In some cases, on account of these complications, it was such a difficult matter to convert these cars from one form to another, that they have been used simply as ordinary cars for such classes of freight as they happened to be adapted without changes. The additional parts, also, were so liable to derangement that the cost of maintenance was excessive, and up to this time no one has brought out a combination car which has met with favor. A number of prominent men, however, are working on the problem as it is evident that a satisfactory combination car will reduce the empty car mileage and in that way effect a saving.

Mr. Manning's car is about as simple as anything of this kind we have seen, and this is probably due to the fact that it is only the intention to alter the floor arrangement. This is done by flush doors which cover the hopper openings when the car is to be used for grain, merchandise, lumber, or other freight that is commonly carried in flat-bottom box cars; when coal, coke or ore are to be carried, it is only necessary to raise or lower these doors to bring the hopper-bottom into use, and it is expected that unskilled men will be able to do this work.

Referring to the engravings, it will be seen that there are four hoppers, two on either side of the middle of the car and located between the center and side sills. There is nothing about the hoppers or hopper doors essentially different from what is now used. The same may be said of the underframe and superstructure, excepting that in the use of a pressed steel underframe and wood superstructure the sample car will represent the latest ideas in car design. The full floor lines in Fig. 1 show the arrangement of the doors for a flat-bottom car, the doors A and B covering the hopper, and the doors C being swung back out of the way, and held against the sides of the car. In the same way Fig. 2 shows how doors A fold back to make the ridge at the center, doors B are turned backward and rest on the floor, and the doors C, when turned down, make the sloping hopper floors at the ends. There are sliding side doors at the middle and loading ports, 2 ft. 6 in. wide, in the sides near either end.

The details of the car are clearly shown in Fig. 1, the side sills, center sills, end sills, cross-ties and bolsters being pressed steel shapes. The superstructure is attached to the frame through timbers bolted to angle brackets which, in turn, are riveted to the longitudinal sills. A study of the drawings will show that the details have been worked out with more than ordinary care.

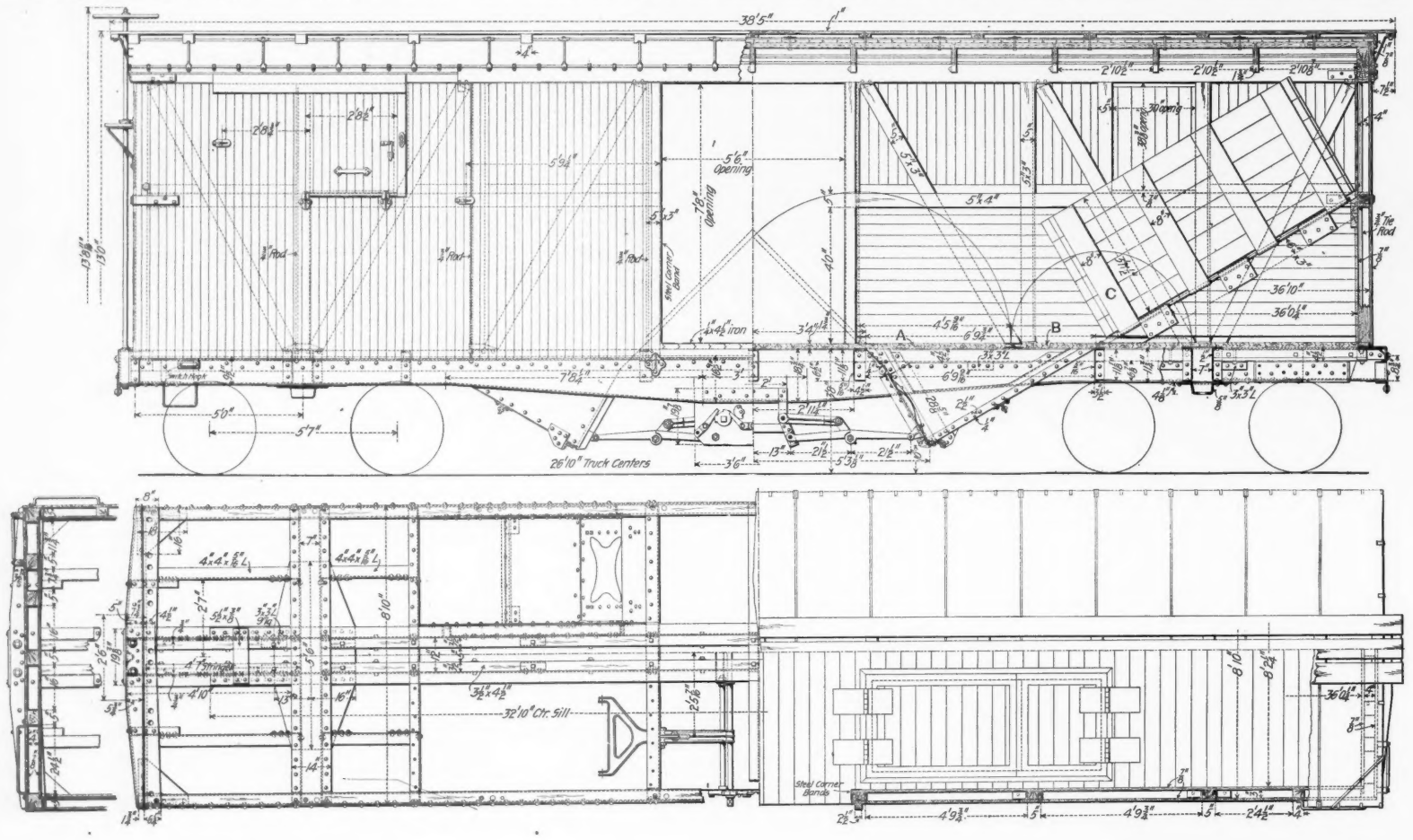


Fig. 1.—36-ft. Combination Car for the Baltimore & Ohio.

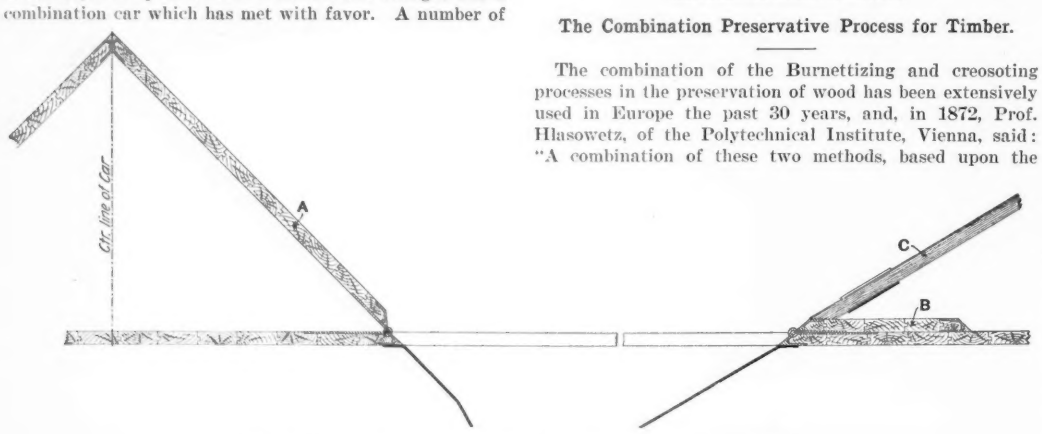


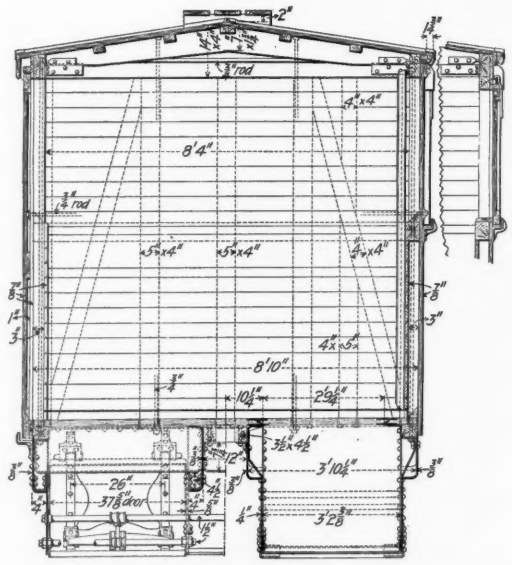
Fig. 2.—Floor Arrangement When Car Is Used for Dumping.

The Combination Preservative Process for Timber.

The combination of the Burnettizing and creosoting processes in the preservation of wood has been extensively used in Europe the past 30 years, and, in 1872, Prof. Hlasowetz, of the Polytechnical Institute, Vienna, said: "A combination of these two methods, based upon the fact that carbolic acid is soluble in considerable quantities in a chloride of zinc solution is therefore a happy thought, for thereby the impregnation fluid can be made to penetrate more easily into the interior, because with the addition of carbolic acid it has the capacity in a degree to dissolve the resinous contents of the wood. This can not be accomplished with the pure solution of chloride of zinc, and it may also be expected that such a mixture will enter with the protein substances of the wood into more insoluble, or other rot-resisting compounds, than the chloride of zinc solution alone."

There are two forms of combination; one mechanical, the other chemical. The mechanical mixture is formed of zinc chloride and creosote containing 20 to 25 per cent. of tar acids. To inject this mixture requires much the same process and expensive machinery as does the injection of creosote alone. Hence, the saving over the old creosote process is not as pronounced as it is under the chemical combination hereinafter described. The mechanical process was chiefly introduced by the Ruetgers, being extensively and sucessfully used by them in their works.

The other combination is a chemical one, in which the dead oil of coal tar creosote, rich in preservative elements and tar acids, is reduced by the action of chlorine gas to a fluid which readily penetrates the wood; and, as the preservative action of the creosote is intensified by the highly antiseptic chlorine, its efficiency is increased,



rather than diminished, by the chemical changes. Also the uses of the material are greatly extended, since expensive machinery and transportation of lumber is dispensed with, and the preservative can be applied anywhere with a brush like paint, or by dipping the wood into the fluid contained in open vats or tanks. This combination was introduced in 1870, and is known as the Avenarius Carbolineum.

In his paper before the Western Society of Engineers,

March 21, 1900, Mr. Chanute, giving the result of his recent trip to Europe for tne purpose of investigating the subject of wood preservation "deems it desirable that the zinc-creosote process shall be introduced in the United States," but gives his reasons why its introduction will take time as follows: "Moreover, for straight creosoting only 10 per cent. of tar acids are required in the tar oil, but for the 'zinc-creosote' process a *peculiar quality* of tar oil containing 20 to 25 per cent. of tar acids is required, which quality is not now produced in the United States. The introduction of this process therefore requires material changes in the distillation of coal tar in this country, or in the importation of foreign tar oils, which are just now very scarce and high."

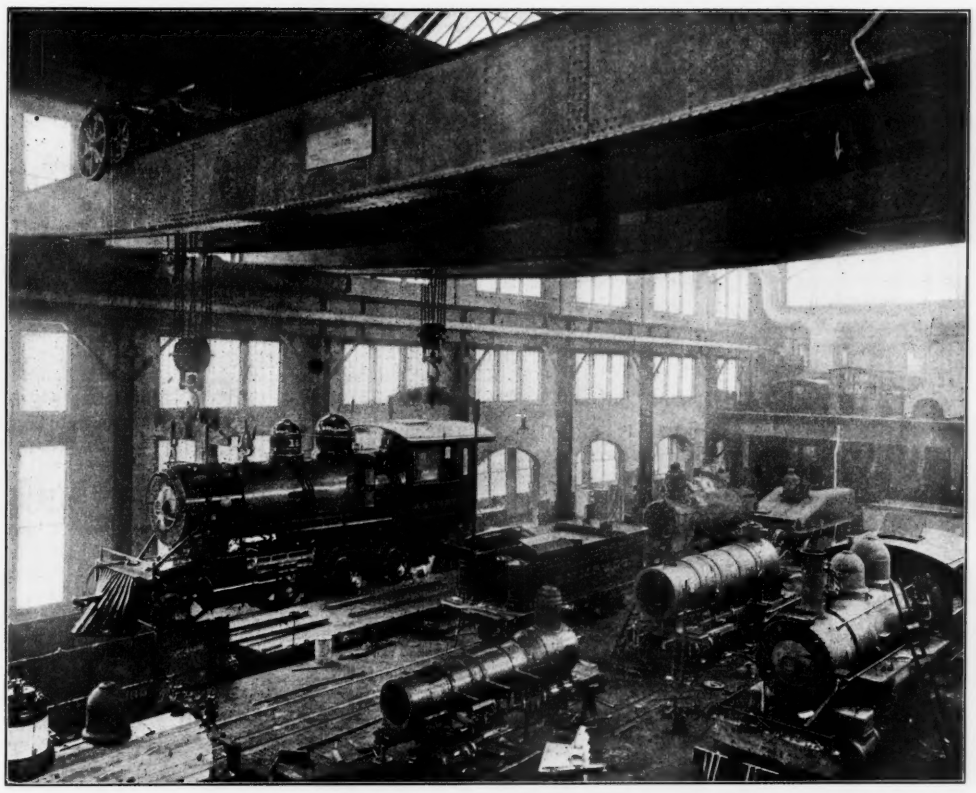
The composition of the tar oils used in both forms of the combination process being practically the same, the reason appears why the finished product from the Avenarius process can not be manufactured and sold at as low a price as commercial creosote, though, because of the larger quantity of preservative chemicals which it contains and the saving of much of the labor and inconvenience of application, the expense of using it is really in the end much less. It also appears to have the advantage over crude creosote in that the phenol (C_6H_5OH) in creosote, soluble in water, is converted by chlorine into the insoluble chlor-phenisic acid, or trichlorophenol ($C_6H_2Cl_3OH$); besides the tar oil used in its manufacture, as before stated, contains from 100 to 150 per cent. more of carbolic and other tar acids, than the commercial creosote.

This Avenarius Carbolineum, or chlorinated creosote, is controlled here by Dr. C. S. McKinney, Chemist and General Manager of the Carbolineum Wood-Preserving Co. It is a definite chemical compound of high specific gravity and great viscosity but very penetrating properties, as shown by splitting pieces of wood which have been treated with it. The preservative shows deeply, similar to the chill in the tread of a cast iron car wheel. It is a complete antiseptic and has been found effective when two or three coats are applied as a paint. While the statement of Mr. Chanute is undoubtedly true that creosoting is effective nearly in proportion to the quantities injected, it is also true that there is large use for a penetrating antiseptic, applied with a brush, or in which bridge and car timbers can be dipped either before or after framing, where a highly expensive injecting plant is impracticable.

Mr. Blair Burwell, Chief Engineer of the Florida, Central & Peninsular Railroad, where Dr. McKinney's Carbolineum has been used for the past eight years, says that the cost of material and application is "amply covered by $4.50 per thousand feet board measure." Mr. Hunter McDonald, Chief Engineer of the Nashville, Chattanooga & St. Louis, estimates the additional cost of using the Carbolineum Avenarius at $2.50 per 1,000 ft. B. M. This coat varies with the number of applications made, and also, slightly, with the dimensions, kind and condition of the timber treated and degree of exposure to which it is to be subjected. The general subject of the economy of using preservatives for ties and for car and bridge timbers has been fully discussed in articles in the *Railroad Gazette* during the past year and the methods of steaming and fully impregnating under high pressure have been described. This less costly method is designed to accomplish a good result by protecting the surfaces, and to a considerable depth beneath the surface, without the use of an extensive plant.

The New Erecting Shop of the H. K. Porter Company.

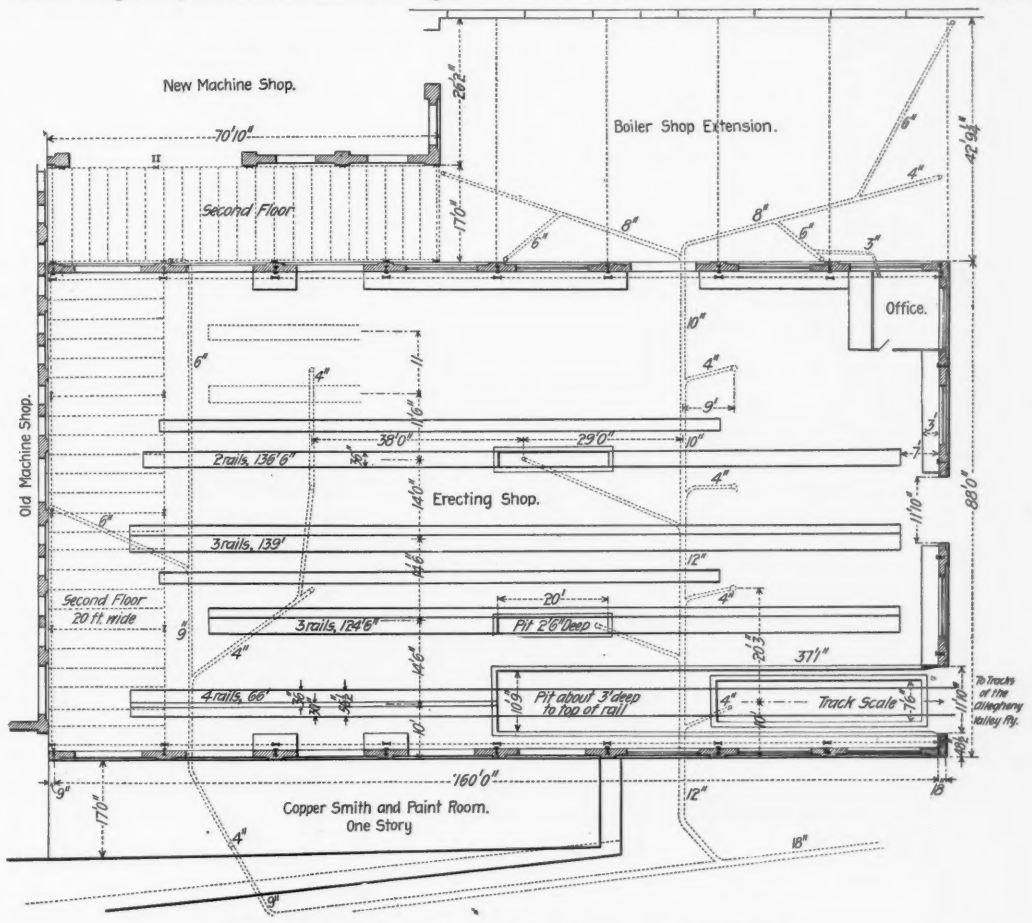
The accompanying engravings show the new erecting shop of the H. K. Porter Co., Pittsburgh, Pa., which is a good example of one having longitudinal tracks served by overhead cranes. As is well known, this company makes a specialty of small steam and compressed air locomotives and the chief requirement is to assemble these light engines rapidly. Two overhead electric traveling cranes, each of 25 tons capacity, are capable of carrying the largest engines there built, as shown by the half-tone engraving.



New Erecting Shop of the H. K. Porter Company, Pittsburgh, Pa.

It will be seen from the plan that the scales are on a depressed track which leads out of the shop to the Allegheny Valley Ry., and there are five erecting tracks with three rails each, for narrow and standard gage engines. The depressed track facilitates loading small engines on cars. The system of drainage is also shown by the plan.

At one end of the shop is a 20-ft. gallery, or platform, served by the cranes, upon which cabs and similar parts can be placed until needed in erection. The building has steel roof trusses, the height of the lower chords above the floor being 43 ft., and from the floor to the top of the rails upon which the cranes run is 30 ft. At one side, in a one-story addition to the erecting shop, are the coppersmith and paint rooms. The machine shops open into the erecting shop on two sides and the boiler shop on one side, while the blacksmith shop is in a separate building just to the right of the erecting shop. Especial attention has been given to providing sufficient light, and it will be noticed from the interior view, that there are large windows in the side and end walls in addition to skylights in the roof.



Plan of the New Erecting Shop of the H. K. Porter Company.

National Freight Agents' Association.

The thirteenth annual meeting of the National Association of Local Freight Agents' Associations met in Faneuil Hall, Boston, on June 12, President Malcolm Townsend (Pennsylvania Railroad, New York) in the chair.

The delegates were welcomed to the city by Mayor Thomas N. Hart, and words of approval and encouragement were spoken by President Lucius Tuttle, of the Boston & Maine.

After the first session the Association met at the Brunswick Hotel. The several officers and standing committees reported favorable conditions throughout. Six additional cities were added to membership during the year, viz.: Denver, Col.; Des Moines, Ia.; South Chicago, Ill.; Easton, Pa.; Albany, N. Y., and Montgomery, Ala. These have forty local members. The National Association now includes 56 Local Associations with 560 members, of which 29 were represented at this meeting by 110 delegates. The treasurer's report indicated a healthy financial condition.

After the usual routine business the topics assigned by the conference committee, to be handled by the representatives of different cities, were taken up.

Atlanta.—"What tally system or plan will overcome errors incident to handling cotton in and out of car and in and out of storage warehouses?" There was a long discussion, during which it developed that much trouble is experienced by agents at points where crops are concentrated by the variety of marks made by shippers through whose hands the cotton passes before being compressed. These marks cause much confusion in the identity of the cotton thereafter. It was suggested that before being compressed, shippers' marks should be placed only on ends; and on the sides of bale afterward. A special committee of six members was chosen, three from points south and three from north of the Ohio River, to devise some plan to make this or some other practice uniform.

Augusta.—"Is it practicable and desirable to verify weights on packages received and forwarded?" This was generally discussed. But few cities are attempting to weigh all less than carload shipments, and some of these report indifferent results. A thorough test of the matter was reported from different territories, all with good results. Some could speak only in a general way. One agent gave interesting figures showing the gain in weight of l. c. l. shipments outbound, to have been from 17.5 per cent. to 22.2 per cent., and in revenue from $24.43 per month at a small non-competitive station to $800 per month at a large terminal station. The expense incurred incident to the weighing was in no case more than 17.6 of the increase in revenue. It was unani-

mously agreed that all stations ought to be required to weigh and so specify on billing out-bound; and also in-bound in the absence of information on billing that freight had been weighed. This recommendation was sent to the conference committee for them to take up with the managers.

Buffalo.—"What are the advantages of inter-line billing and the settlement of freight exchange accounts through the auditing department?" It was voted as the sense of the delegates that through billing should be adopted wherever consistent.

Cincinnati.—Joint messenger service for delivery of notices of arrival of freight, carload and less, works well in Cincinnati and the local association recommends the plan to others.

Chicago.—"What is the best method of keeping proper check upon the station accounts in local freight offices?" The opinion was expressed that there might be some check provided by one who did not handle cash, but other speakers thought the usual methods of heavy bonds and auditor's agents were as effective as any that could be suggested. No recommendation was made.

Fort Wayne.—"How to dispose of freight reaching a station on memorandum or free-astray billing." This applies only to freight bearing insufficient marks to properly identify the owner. It was thought that carrier was responsible for any depreciation in value l reason of delay, but the true remedy would be to require all l. c. l. freight marked in full.

Boston.—"What is the best method of handling water and rail freight to preserve its identity through to destination." Confusion arises when receiving more than one consignment of same kind of freight to same consignee, but from different shippers by same boat and train. For example, A, B and C each ship a number of cases of shoes to the same consignee by same boat from Boston, and on arrival at destination one case is found damaged or is lost. Which consignment is short? It was agreed that the name of the shipper should be stenciled on every package and that case numbers should be entered on way-bill.

Fort Worth.—"Should not regular way-bill accompany freight in all cases?" On this subject Mr. Townsend, New York, submitted the proposition that in this day of fast moving freight, when it often reaches destination in advance of way-bills, which are forwarded by following passenger trains, the shipper's original orders should accompany the car and be billed and expensed by the receiving agent, thus doing away with the out-bound billing department. As the idea was only presented for future consideration no action was taken.

Indianapolis.—"Why should not trunks of personal effects be accepted without being boxed when properly wrapped, strapped, corded and sealed?". Some had experienced loss under the present classification requirements, and others had not had a claim.

Louisville.—"Should a charge be made for placing cars on private track scales to be weighed?" The discussion revealed great diversity of practice. Many make no charge; others charge from 25 cents to $1 per car.

Milwaukee.—"Best method of loading less than carload freight to prevent same getting in wrong car." Should be governed by local conditions, but when possible the ballot system should be used, the return system being preferable to the deposit system.

New York.—"The classification committee should make a rule, that packages presented for shipment will only be received when addressed by marking with brush or stencil on the package." Unanimously agreed to, and the committee was directed to confer with classification committees.

Norfolk.—"Is it practicable to apply car service (demurrage) on foreign and coastwise business?" A diversity of practice exists but it was agreed that a uniform charge should be made.

Omaha.—"Would the distribution of c. l. freight by local agents to various receivers or the concentration of freight at local stations for shipment as a carload be of advantage to railroads?" This practice was condemned.

St. Louis.—"Marking packages with car number and date at time of unloading." This should be done, especially at heavy transfer stations, to assist in identifying packages found over on platforms.

Toledo.—"Should railroads equip cars with grain doors before placing at elevators for loading, or allow elevators to equip at railroad's expense?" As the latter method had led to great abuses, the former should be used.

A special committee made a report recommending that a uniform method be devised by which circulars of each railroad system should be of same size, bear the subject at the head and be indexed thereby. This committee condemned the issuing of circulars such as "John Doe & Co., of Smithville, desire only X. Y. Railway delivery," and "Jones & Co., of Factoryville, will not accept return shipments unless prepaid." One agent stated that his billing desk bore between three and four hundred circulars and it was impossible for any one to remember their requirements.

Wheeling, W. Va., whose name appears near the end of the alphabetical list of members, moved the adoption of a standing rule that hereafter the secretary, before issuing a call for the annual meeting, should determine by lot the order of publication of names, and that such order be observed in the arrangement of topics and roll call for that meeting. This was carried.

The election of officers resulted: President, T. P. Adams (Mo. Pac.), St. Louis; Vice-President, C. T. Lamb (Southern), Norfolk; Secretary, James Anderson (C., B. & Q.), Omaha; Treasurer, C. H. Newton (Wabash), Fort Wayne. Denver was selected as the place for the next annual meeting.

The delegates visited the terminals of Boston and were otherwise happily cared for by the Boston Association. On Thursday afternoon they had an outing at Nantasket Beach, with a banquet at the Atlantic Hotel. The delegates were well pleased with the good results of the meeting, all believing them to be better than those of any previous meeting.

Open-Hearth Steel Boiler Plates.

A comparison of the Specifications proposed by the American Committee of the International Association for Testing Materials with the Standard Specifications of the American Railway Master Mechanics' Association, and others.

BY T. L. CONDRON, ASSOC. M. AM. SOC. C. E.

The specifications for open-hearth boiler plates recommended by the American Branch of Committee No. 1, International Association for Testing Materials, and printed in the *Railroad Gazette* of May 18th, together with the elaborate tabulation of existing specifications, has led the writer to revive and revise the diagrams which accompanied his paper on "Open-hearth Boiler and Fire-box Steel" before the Western Society of Engineers, in 1896.* These diagrams, Figs. 1 and 2, have been redrawn so as to accord with the figures given in the tables referred to, as several of the railroad companies have modified their specifications since the publication of the first diagrams. In order to indicate clearly the variations of the several specifications with reference to the proposed specifications, the limits of the latter have been extended across the diagrams by dotted lines. It should be stated that there are eight specifications on each of these diagrams that are not given in the table published by the Committee. These eight specifications are those of the following railroads: Chicago, Milwaukee & St. Paul; Chicago, Rock Island & Pacific; Delaware, Lackawanna & Western; Kansas City, Fort Scott & Memphis; Louisville & Nashville, Lehigh Valley, Philadelphia & Reading and the Union Pacific. Hence the specifications platted for the roads were those in effect in 1896. There were nine specifications in the table that are not reproduced here. They were those of the Brooks, Cooke and Richmond Locomotive Works, the Heine Boiler Co., and P. B. & L. E., Queen & Crescent, Southern Pacific, White Pass & Yukon, and Mexican Central.

The object of these diagrams is to present in a manner as clear and striking as possible, the great diversity among the specifications now in use, and to emphasize the desirability of having uniform specifications for materials intended for similar use. If standard specifications can be agreed upon for each class of steel, it is reasonable to believe that it will be as much to the advantage of the buyers, as to the manufacturers. The manufacturers can then concentrate their efforts toward increasing the uniformity of their products. At present it is necessary for them to endeavor, each day, to meet a wide variety of specifications, often being obliged to roll from a single heeat of steel small tonnages on two or more widely differing specifications.

Boiler Shell Steel.—Referring to Fig. 1, it will be interesting to note that these proposed specifications for boiler shell plates are considerably more exacting than the "Master Mechanics'" specifications. The latter have always been open to the criticism of being less, instead of more rigid than the usual specifications for *structural* steel. The Association of American Steel Manufacturers in 1896 recognized the necessity of offering as a standard specification, one better than the "Master Mechanics'" specification, placed limits upon phosphorus and sulphur and increased the required elongation in eight inches. The proposed specifications follow very closely these manufacturers' standard specifications of 1896.

The most marked differences between the specifications in use and those proposed, lie in the limits of chemical properties. No restrictions are placed upon carbon. This is in accord with the best opinions on the subject at the present time; it being recognized that it is unwise to specify rigid physical qualities and at the same time limits of carbon, thus restricting the manufacturers' means of securing the physical qualities asked for. It is sufficient to prescribe limits for injurious properties, as is done for phosphorus and sulphur. While a limit of 0.06 per cent. phosphorus had become recognized as a desirable one for this class of steel if made by the acid process, it seems that this should be reduced to 0.04 per cent. for basic steel. So great an authority as Mr. H. H. Campbell, in his treatise on steel, says: "There does not seem to be any proof that basic open-hearth steel of a given composition is more unreliable than acid metal of the same character, but in order to meet any possible danger, and because the cost of a little extra purification is not excessive, it is not amiss to require that the best basic steel shall not show over .04 per cent. phosphorus." Certainly the ordinary layman may question why, with this statement from one so well versed in the metallurgy of steel, should a proposed standard specification for boiler steel not require as low a limit as .04 per cent. for basic steel. There is reason to believe that before these specifications are finally acted upon, there will be a reduction of the limits proposed for both phosphorus and sulphur.

*See Journal of the Western Society of Engineers, October, 1896.

Good steel may be ruined, however, in the endeavor to reduce the phosphorus and sulphur too low.

The increase in tensile strength over the specifications of the steel manufactures is all right, provided the plates are to be reamed and planed, as should be the universal practice in boiler construction. However, this practice is not universal at the present time, and it is therefore important that a steel be provided for those who still persist in simply punching and shearing plates with a bevel shear. The steel so used should be kept below 62,000 lbs. per sq. in. tensile strength.

There seems to be no good reason for specifying the "yield point" for this class of material. To determine this property of steel requires a more careful and delicate test than is possible in a mill testing room, where rapidity of testing is a necessity. The "drop of the beam" which is given as the means of determining the "yield point" is unfortunately not as well defined a stage of the test as might be supposed; the beam "drops" not once only, but several times at about this critical point, and different observers may honestly select "drops" to record which are 5,000 or more pounds apart. The sensitiveness of the automatic counterbalance attachment on the testing machine also affects this determination. Therefore, in the writer's opinion, this is a useless detail of a specification, unless it is to be determined by means of an extensometer. It is at present impracticable to make such delicate tests in the regular conduct of mill testing.

The proposed elongation of 25 per cent. in 8 inches is desirable. It is to be noted that this is higher than has been generally specified for steel with as high tensile strength as 65,000 lbs. per sq. in. This percentage of elongation insures getting a steel sufficiently ductile and tough as well as having great tensile strength. The "reduction of area" is but another measure of the ductility and adds no real value to the record of a test in which the elongation has been carefully noted, and therefore its absence from the proposed specifications, gives no ground for criticism.

Attention should be called to the modifications in elongation proposed, but not shown on the diagram. They are: "1 per cent. deduction for each ⅛ in. increase in thickness over ¾ in., and 2½ per cent. deduction for each 1-16 in. decrease in thickness below 5-16 in." These modifications are entirely reasonable when the shape of the standard test specimen is considered, Fig. 3.

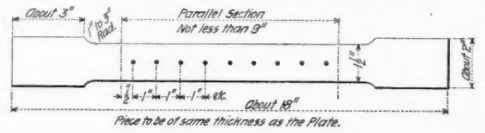


Fig. 3.

Fire-Box Steel.—Many of the above comments on boiler shell steel, apply with equal force to the specifications for fire-box steel shown in the diagram, Fig. 2. Here, in the proposed specifications, the phosphorus and sulphur have been cut down to 0.04 per cent. in each case, and these limits would seem to be sufficiently low. Excess of sulphur causes the most trouble to the steel maker himself, during the rolling of plates, and if the plates pass through the process of rolling safely, and come out without injury, it is more than likely that there will be no trouble from sulphur later. Reasonably low sulphur tends to insure that in the rolling injury will not be done, which might later escape detection by even rigid inspection.

The lower tensile strength proposed than that called for by the "Master Mechanics'" specifications, is in every way desirable for this class of steel. The allowance of so high a tensile strength as 65,000 lbs. per sq. in. and but 22 per cent. elongation as permitted in the specifications of the "Master Mechanics" is open to serious criticism, in the case of plates for fire-boxes. The manufacturers have as a rule endeavored to keep near to the lower, or 55,000 lbs., limit of these specifications and the steel generally furnished has shown an elongation in 8 in. of 26 to 30 per cent. The only claim that can be raised by those favoring steel of 60,000 lbs. or more tensile strength is that the threads for the stay bolts will hold better in the higher steel, but it has seldom been the threads that gave out in the case of failure, but rather that the plate cracked from the threaded holes.

Bending and Homogeneity Tests.—The specifications recommended by the Committee very wisely provide for both cold and quenched bending tests requiring that a specimen cut from each plate ¾ in. or less in thickness, shall stand bending 180° flat on itself. One cold bending specimen and one quenched bending specimen are required to be furnished from each plate as it is rolled. It should be remembered that these test specimens for bending as well as the tension test pieces have the sheared edges removed by planing or milling, and therefore it is not to be expected that the plates themselves will stand this same test if bent with sheared edges. For plates over ¾ in. in thickness it is provided that specimens for bending may be reduced to a thickness of ½ in. As we frequently see boiler steel an inch or more in thickness that has been bent cold 180° flat it would seem that the limiting thickness for full-sized bend tests should have been raised to at least 1 in. Quite recently the writer saw some successful cold bend tests of plates over 2 in. thick intended for marine boilers. These specimens were bent 180° flat.

The homogeneity test for fire-box steel is the one commonly known as the Pennsylvania Railroad test and is intended to determine if the plate is free from laminations or defects due to the flattening out of small cavities in the steel, the sides of which do not weld together. The requirements set down for this test, the method of making

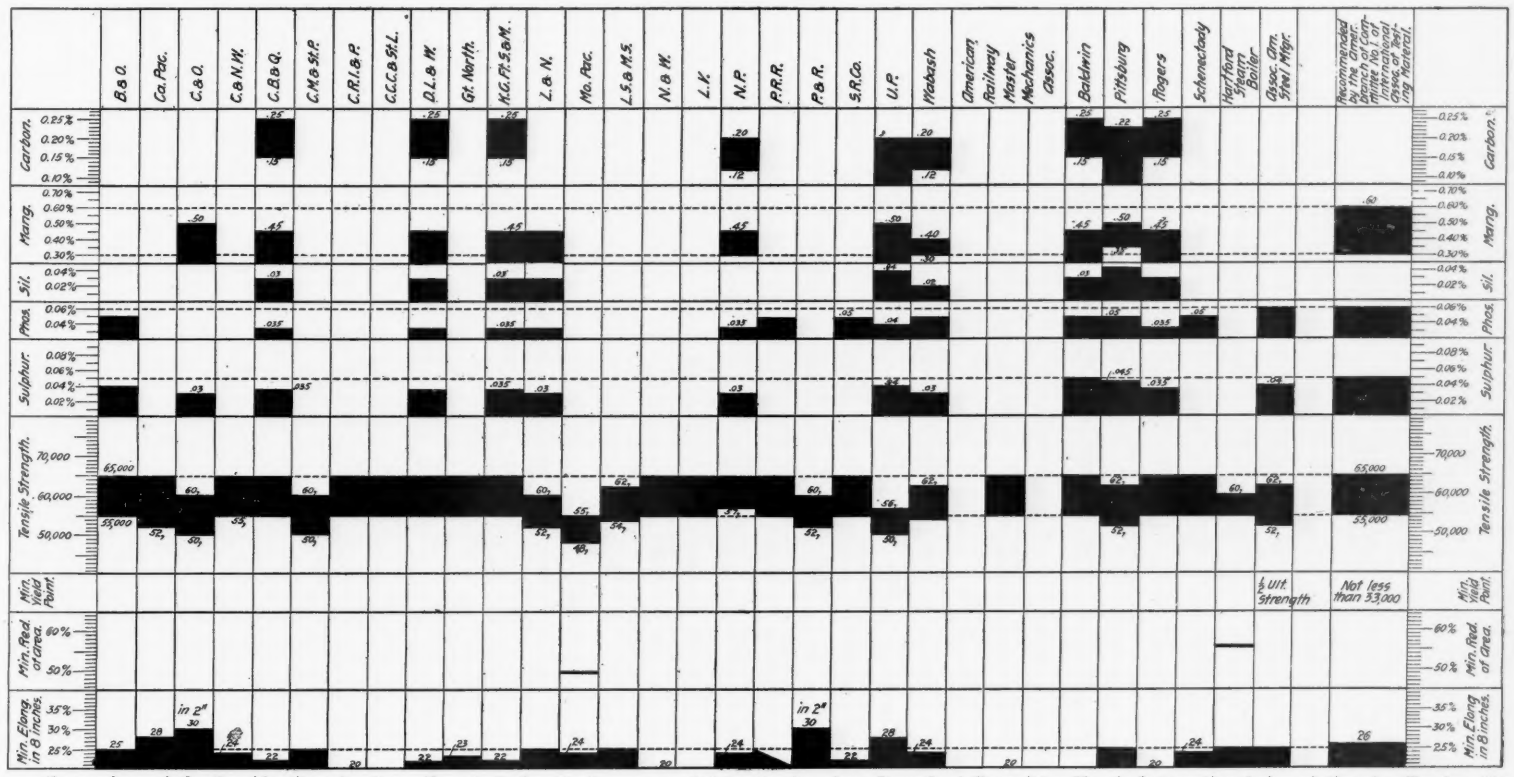
which is carefully described, are that no single seam or cavity more than ¼ in. long shall appear.

The branding of plates and the allowances for variation in thickness and weight are provided for in a way that is entirely reasonable and should be satisfactory to both manufacturer and buyer.

Chemical Analysis.—The clause in the proposed specifications regarding chemical analysis is as follows: "In order to determine if the material conforms to the chemical limitations prescribed herein, analysis shall be made of drillings taken from a small test ingot. An additional check analysis may be made from a tensile specimen of each melt used on an order other than in locomotive fire-box steel. In the case of locomotive fire-box steel a check analysis may be made from the tensile specimen from each plate as rolled."

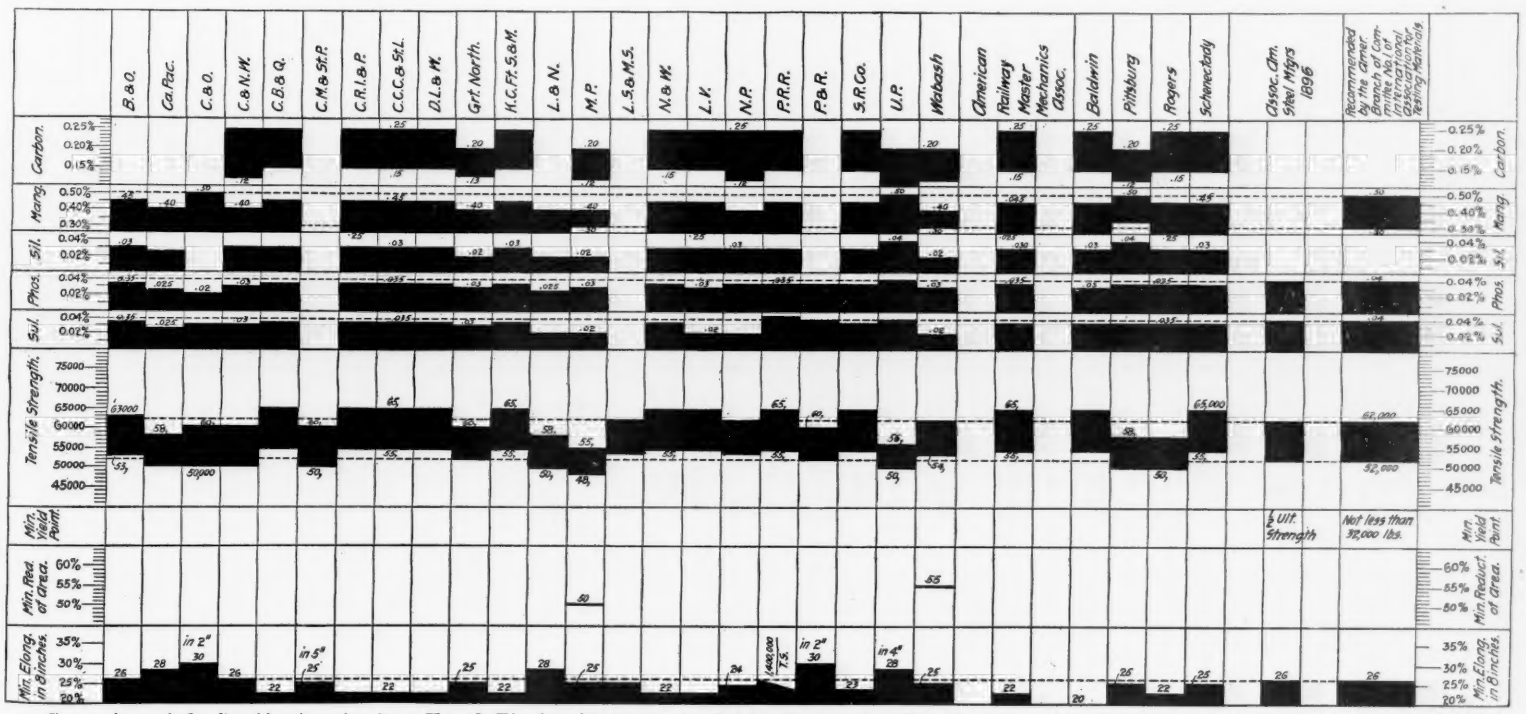
It appears surprising that in this specification the Committee has not made some provision for the almost certain variation between the analyses of test ingots and those of the finished product. There should oe a difference of 25 per cent. provided for; that is, drillings from tension test pieces should be allowed an excess of 25 per cent. more phosphorus and sulphur than is allowed in the drillings from small test ingots. In the latter case it is presumed that a fairer average of the composition of the entire melt is obtained while in the former case the possible segregation in a particular spot is liable to be encountered. Some definite provision should be made regarding analyses of drillings, from tension specimens, whether they are to be made by an outside chemist for the buyer, or by the chemist of the mill, in order to prevent misunderstandings and vexatious delays. Both the manufacturer and the buyer suffer from ambiguities in such matters.

Inspection.—The proposed specifications simply provide that "the inspector representing the purchaser shall have all reasonable facilities afforded to him bv the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment." This reads very well, but what does it mean? Absolutely nothing. It is like the time-honored clause in specifications that "the material shall be first class in every particular." This clause, however, has two redeeming features, one is brevity, and the other that it gives employment to lawyers, arbitrators and "expert witnesses." No provision is made in the proposed specifications for even match-marking test specimens, and the manufacturer would be the one to decide what constituted *reasonable facilities.* Certainly for such important material as boiler and fire-box plates, a specification should reserve for the buyer the right to have his inspection guided by certain clearly defined instructions which should be recognized by the manufacturer as of equal importance with the carefully stated physical and chemical requirements. It is not suprising that manufacturers object to certain kinds of inspection and the two most serious faults found are, first, inspection by low-priced, inexperienced and not infrequently unintelligent inspectors clothed with an amount of power and authority out of all proportion to their ability to properly exercise; and second, to the hypercritical type of inspector who insists on the narrowest possible interpretation of the letter of his specifications, overlooking entirely the broader intent and spirit of the same. Therefore, in a standard specification there should be included a carefully worded paragraph defining exactly the duties, the privileges, and the restrictions of the inspector. This would make it easier for him to attend to his duties and would tend to raise the standard of this work. In the case of the particular material under consideration. the following is suggested as a suitable paragraph regarding inspection:



Comparison of the Specifications for Open-Hearth Boiler Steel recommended by the American Branch of Committee No. 1, International Association for Testing Materials with the existing Specifications of various Railroads, Locomotive Builders, the American Railway Master Mechanics' Association, and the Association of American Steel Manufacturers. The dotted lines indicate the limits of the proposed Specifications.

Fig. 1.—Boiler Shell Steel.



Comparison of the Specifications for Open-Hearth Fire-box Steel recommended by the American Branch of Committee No. 1, International Association for Testing Materials with the existing Specifications of various Railroads, Locomotive Builders, the American Railway Master Mechanics' Association, and the Association of American Steel Manufacturers. The dotted lines indicate the limits of the proposed Specifications.

Fig. 2.—Fire Box Steel.

The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to enable him to determine that the finished material is furnished in accordance with these specifications. He shall witness all tests and certify to the correctness of the records of the same. He shall personally match the test specimens to the plates they were cut from, after the tests have been made, and shall place his private stamp on each plate which he accepts. All plates shall be so

handled for inspection that the inspector can carefully examine both sides and all edges, and gage the plate in at least four widely separated points. In case a plate is rejected on test or for surface defects, it shall be immediately removed from proximity to the accepted material and all marks pertaining to that particular order, erased from it. A copy of every shipping bill shall be furnished the inspector, giving in detail all material shipped, subject to his inspection. On this bill must appear all of the identifying marks on the plates, including the heat numbers and the scale weights. This bill must be certified to by the inspector as being correct before being forwarded to the buyer.

All tests and inspection shall be made at the place of manufacture, prior to shipment.

It is to be hoped that there will be a free discussion of all the specifications recommended by the Committee, and that its effort to get the early adoption of standards meets with every encouragement and is crowned with success.

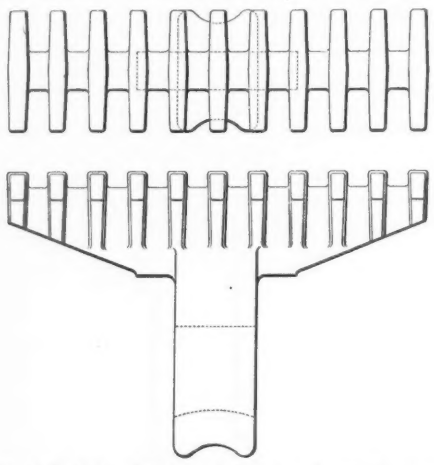
Coke for Locomotive Fuel.

BY GEORGE L. FOWLER.

The smoke nuisance that the early opponents to railroad construction feared would result in the blighting of vegetation along the line, while proving an imaginary bug-a-boo in this respect, has risen again as a veritable trouble when viewed from the end-of-the-century standpoint of comfort and cleanliness. Despite the many smoke consumers and smoke preventers that have been invented, it still seems to be one of the impossibilities to burn bituminous coal economically in a locomotive boiler without producing smoke. The three fuels that can be burned without smoke are anthracite coal, oil and coke. The first is in successful operation over the limited area adjacent to the anthracite mines; the second is out of the race on account of price, while the third has been successfully used for many years on European railroads, and has recently received a somewhat extensive adoption on two of the New England railroads.

Before entering upon the details of its use in America, let us take a brief review of European practice and note some of the results that have been accomplished there.

An application of coke burning was made in the early forties and for a number of years the rate of consumption rapidly increased. Late in the fifties, however, the demand for coke for metallurgical purposes became so great that the price rose to a point making it much more expensive than coal for a locomotive fuel. For the past forty years, therefore, there has been practically no coke burned on the locomotives of Germany, and now it is only used on the urban lines of Berlin and Hamburg. It is, however, used on the French locomotives where an absence of smoke is the main desideratum. It is indispensable where cars having an imperial or roof seats are used, and this forms a large item of the suburban traffic, especially in and about Paris. On these trains there is an entire absence of smoke; but, as the trains are



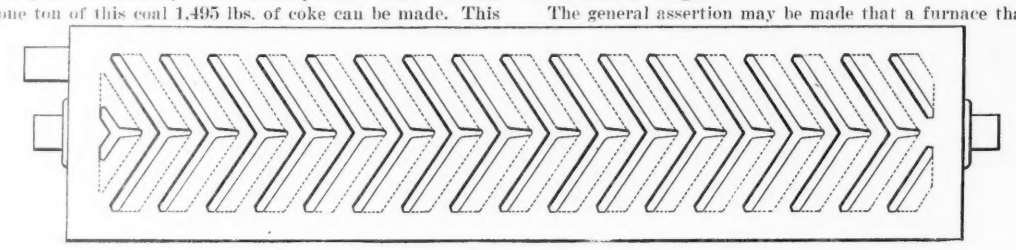
Detail of Rocking Section of Cellular Grate—Boston & Albany R. R.

light and the speed slow, the problems involved in the burning of coke are not serious and no difficulty is experienced in the maintenance of the steam pressure.

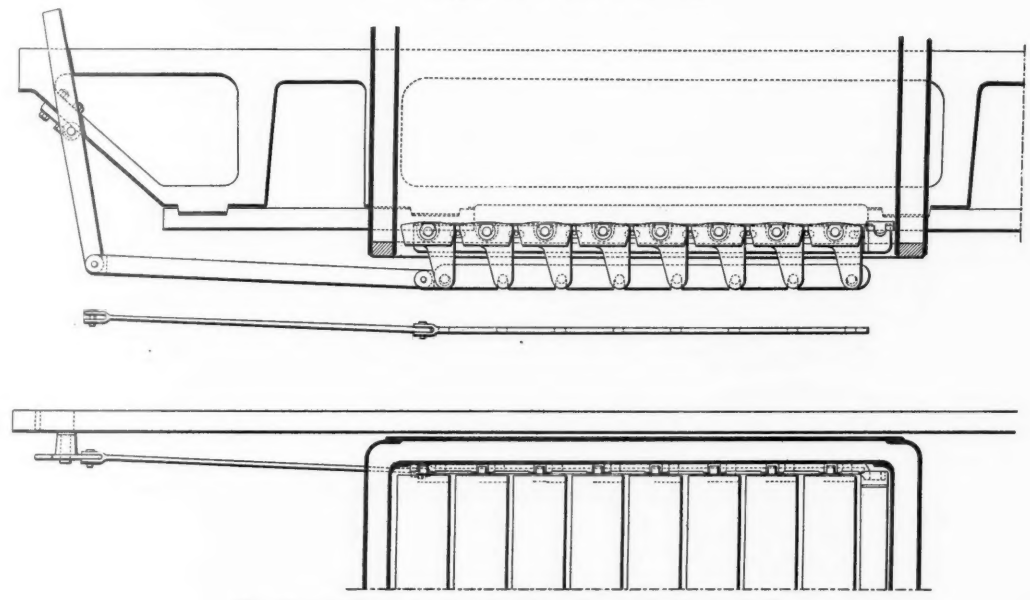
The coke used has the appearance of being a good grade of gas coke and is somewhat softer than that burned in the locomotives of the New England railroads. It seems to be the universal testimony of European engineers that a somewhat larger exhaust nozzle can be used than with coal and that a very deep bed of fuel must be kept upon the grates; propositions to which American practice agrees only in the latter particular. There is some variation in the composition of the coke used, but the percentage of fixed carbon does not differ greatly between France and New England with a slight advantage in favor of this country. Cost has been the obstruction to its more extensive use in Europe just as it has been to its introduction in this country.

Several attempts have been made in the United States, but they were few and isolated, and were not successful. When gas coke was used it was found to be too light and with an insufficient heating capacity to make it a satisfactory steam fuel. Furnace coke, on the other hand, possessed all the qualities of a fine steam fuel, but was too expensive to compete with coal. It was not until coke was offered at a reasonable figure to some of the New England roads that it was used extensively in this country. The Boston & Maine was the first to adopt it for a portion of its service, and in this it has been followed in a more limited way by the Boston & Albany. It is to the Superintendents of Motive Power of these two roads, Messrs. Henry Bartlett and T. B. Purvis, that I am indebted for the opportunity to investigate the work that is being done.

The coke is supplied by the New England Gas & Coke Co. from their Everett plant and is made from Nova Scotia coal, which is of a quality and price that can not compete successfully with Pennsylvania coals. From one ton of this coal 1,495 lbs. of coke can be made. This



Plan of Tupper Grate for Coal Burning.



The Tupper Grate for Coal Burning—Boston & Albany R. R.

coke is, in appearance, a cross between gas and furnace coke. Some pieces are dark and almost black, and very light and porous, others are of the steel-gray color characteristic of furnace coke. Usually both kinds occur in each piece. Analyses of this coke show it to average about as follows:

Fixed carbon	87.91	per cent.
Moisture	.17	" "
Volatile matter	3.69	" "
Ash	8.23	" "
	100.00	" "

The ash analysis gives:

Iron	3.20	parts
Sulphur	1.33	"

If the yield of coke given above be taken as the basis for a calculation of the composition of the coal, the latter will be found to be:

Coke	74.75	per cent.
Volatile matter	25.25	" "
	100.00	" "

Taking this as a basis of a detailed approximate quantitative analysis we have:

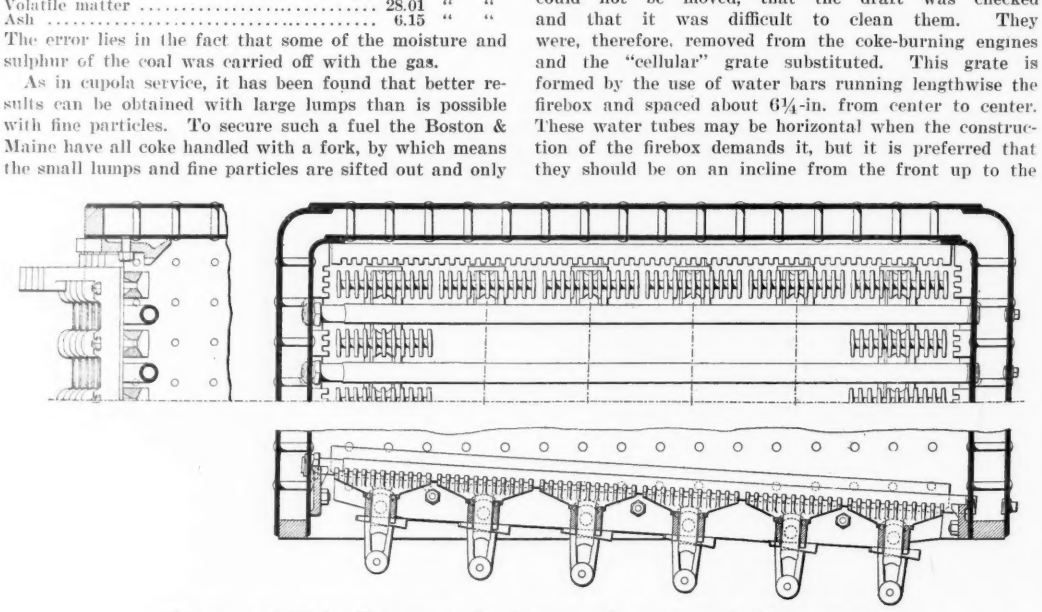
Fixed carbon	65.71	per cent.
Moisture	.13	" "
Volatile matter	28.01	" "
Ash	6.15	" "

The error lies in the fact that some of the moisture and sulphur of the coal was carried off with the gas.

As in cupola service, it has been found that better results can be obtained with large lumps than is possible with fine particles. To secure such a fuel the Boston & Maine have all coke handled with a fork, by which means the small lumps and fine particles are sifted out and only the larger pieces put on the tender. On the Boston & Albany the coke is handled by the regular coal handling machinery, with the result that considerable breakage occurs and much fine stuff goes on the tenders. The firemen are not required to use this material, but are at liberty to throw it out at terminals. In fact, very little is thus thrown away, as the firemen have a pride in burning everything, sometimes to the detriment of the steaming properties of the engine as we shall see later. In both places the coke is kept under cover to avoid the absorption of moisture since it has been found that the black portion of the coke, or that resembling gas coke, will absorb 16 per cent. its own weight of water, while the portion resembling furnace coke will absorb 13.07 per cent. its own weight.

The general assertion may be made that a furnace that is fitted to burn the ordinary run of bituminous coal can be used with coke without making any changes. It is usually found to be desirable to make some slight modification in the grates, leaving the other parts unchanged. It apparently makes little difference whether there is a brick arch in the fire-box or not, so far as the steaming qualities of the engine are concerned, though it probably does have a very important influence on the economical use of the fuel. It has not been found to be necessary to make any changes in the front end, and, contrary to accepted European practice, it has been found to be inadvisable to enlarge the exhaust nozzle.

In grates no change has been made on the Boston & Maine, where the standard grate is used for both coal and coke. It is of the finger type and is in two sections. On the Boston & Albany, a special form of grate designed for coke burning is used. The standard for coal is that known as the Tupper grate and consists of a flat plate with V-shaped openings. These can be rocked in the manner shown just as the finger grates. It was found that, when coke was burned on these grates, they became so clogged with clinker that they could not be moved, that the draft was checked and that it was difficult to clean them. They were, therefore, removed from the coke-burning engines and the "cellular" grate substituted. This grate is formed by the use of water bars running lengthwise the firebox and spaced about 6¼-in. from center to center. These water tubes may be horizontal when the construction of the firebox demands it, but it is preferred that they should be on an incline from the front up to the back. They have an outside diameter of 2 in., and are screwed into the back tube sheet and held by a bushing screwed into the front sheet.



Cellular and Water-Tube Grate for Coke Burning—Boston & Albany R. R.

Between the tubes, there is a series of rocking grates so arranged that each short section with a length of about

10½ in. can be removed and replaced in case it is injured. The rockers are provided with pockets into which the short grates are dropped. These rockers lie below the water bars where they are well away from the fire, while the fingers are so designed that the maximum of air space is obtained while there are no heavy sections of metal to become heated, the circulation of air having a tendency to keep the parts in contact with the fire cool. These grates are easily rocked; they are of such shape that they readily break such layers of clinkers as may have formed above them, and there is an ample opening between them, when they are tipped, to allow the broken masses of clinkers to fall into the ashpan. The grates have proven themselves very efficient in service.

In the manipulation of a coke fire it is universally agreed that is must be as deep as the firebox will permit and that the fire must be in first-class condition with a full head of steam when the engine leaves the terminal. Unless this precaution is taken it will be found to be impossible to maintain the necessary steam pressure throughout the run.

On the road, coke can not be subjected to the same rough treatment that can be given to bituminous coal, but must be treated more with the care that is given to anthracite, and no slicing of the fire can be done. The method usually employed is to fill the firebox with coke at the terminal and put on the blower, taking pains that the whole mass is thoroughly well ignited before the start. The filling of the firebox must be taken literally. If there is a brick arch the coke is made to fill the whole space between it and the grates and is heaped up in front of the door as high as it can be shoveled. When there is no brick arch the coke is brought up to the level of the bottom row of tubes and again heaped as high as possible before the door.

After the start the method of firing depends upon the weight of the train and the frequency of the stops, just as in the case of any other fuel. For example in local and suburban traffic the fireman should do all of the stoking after steam is shut off for a station stop. This leaves an undisturbed and vigorous fire while the engine is at work. The quantity used depends on the work to be done. Thus, in the case of an engine hauling a two-car suburban train, the firing averages three shovelfuls at each station, filling the firebox again at the terminal with thirty-six shovelfuls. During an hour's trip with such a light train it will not be necessary to touch the grates. With the same engine hauling four cars over the same route, the average firing amounted to five shovelfuls, showing that the fuel burned bears a close approximation to the weight of the train. It will also be necessary to shake the grates at least once. With a six-car train the average quantity fired at each station is eight shovelfuls. This method allows the engine to run into the terminal with the fire burned down to a considerable extent, and yet with a sufficient head of steam to insure the proper handling of the train.

In the local traffic, where the engine is run over the whole length of the division, the same method of firing can be employed, the quantity put in being varied with the distance between stations and the grades to be encountered. On such a run the firing is naturally heavier, the grates must be shaken oftener and the greatest care exercised that the fuel is burning brightly at all times.

On an express run with a heavy train it, of course, becomes necessary to do some firing while the engine is at work, though the careful fireman will watch his chances and fill the firebox on favorable grades. On such trains it may be taken as an axiom of good practice that the firebox is to be kept heaping full at all times. This is the main point to be attended to for, if the bed of fuel is allowed to burn down, the replenishing on the road will be sure to cause trouble. So, while on a local run from 16 to 30 shovelfuls may be thrown in at each station, good practice indicates that from 6 to 10 shovelfuls are quite sufficient on an express train.

In all cases, whether on light suburban train or a through express, good practice dictates that the door should be kept on the latch so that it lacks from 1½ to 3 in. of being closed. This admits a stream of cold air to the top of the fuel, and assists in the combustion of the fuel. Owing to the great quantity of fuel that is heaped upon the grates it seems to be quite impossible, despite the loose character of the mass, to draw a sufficient quantity of oxygen through the air spaces to effect complete combustion. Air admitted above the fire is, therefore, absolutely essential to economical combustion. This is evidenced by the blue flame of the burning carbonic oxide on the surface and also by the fact that when the door is closed the odor of gas is very perceptible whenever the exhaust is thrown down into the cab in running under a highway bridge, while, with the door on the latch it is not noticeable.

On stopping it is the invariable practice to put on the blower; otherwise the gases will back into the cab to the great discomfort of the occupants.

This method of firing and the necessity of having a hot fire at all times, results in a considerable waste of steam through the safety valves. For, as soon as the throttle is closed, the blower is opened and the fire kept burning briskly during the whole of the stop, so that there is a constant flow of steam from the boiler whether useful work is being done or not.

As for the labor of the fireman there is probably not much actual difference. A greater quantity of coke than of coal must be handled in the proportion of about four to three by weight. In bulk the difference is greater and becomes as about seven to three, since the space occupied for the same weights is about as eight to five. Then it is more difficult to take up a shovelful of coke than of coal. The tool does not slip beneath so easily, the large lumps get blocked against each other and a good deal falls off between the tender and the firedoor. To offset this comes the infrequency of firing, by which a man gets a longer interval of rest.

The successful use of coke depends on the amount of attention paid to all of the details here laid down. A shovelful of fine particles thrown into the fire when the engine is at work will have about the same effect as the same quantity of dirt, and when the fine stuff comes down on a grade where the engine is working hard a loss of pressure will almost inevitably follow.

The clinker is also a serious difficulty. It will be noticed that the ash or clinker of the coke used contains a large percentage of iron. It forms deposits in two places, on the tubes and the grates. In the case of the tubes it is deposited about the ends and will gradually close them up. After a run of a hundred miles or more it is not uncommon to find a good percentage of the flues entirely closed and others so clogged that a hole scarcely ¾ in. in diameter is left through them. This is the most serious feature of the clinker as it adheres quite firmly so long as there is a hot fire back of it, but is scraped off with comparative ease when the engine becomes cooler. No analysis of this clinker is available but it seems quite probable that it is formed by the evaporation of the clinker which instantly solidifies and adheres when it comes into contact with the comparatively cold surface of the tubesheet and tubes.

The clinker formed on the grates can be broken and dumped into the ashpan from time to time by rocking the grates. Little trouble is experienced by adherence in the case of special grates used on the Boston & Albany. But where there is a heavy body of iron to become heated, the clinker seems to weld to it in a way that makes it exceedingly difficult to remove, even when the grates have become cool. It does not adhere seriously to the other and thinner parts. In some cases it has been found to be advisable to turn the exhaust from the air pump into the ashpan for the purpose of keeping the grates cool. In others the overflow from the injector has been turned into the same place.

The hotter the bottom of the fire the more trouble with the clinker. In recognition of this fact, the firemen have found it expedient to shake the grates when the engine is working the hardest, as on leaving stations, at which time the greatest quantity of cold air is being drawn into the firebox, cooling the clinker at the bottom and thus making it brittle. It is this clinker that seems to present the most serious difficulties in the utilization of this fuel.

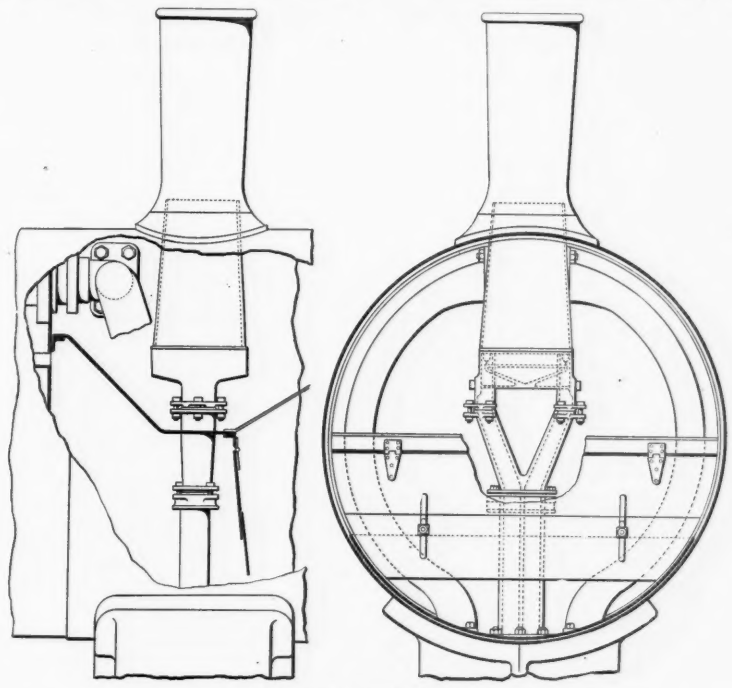
As already stated the clinker can be broken and dumped into the ashpan to certain extent, but at the end of a run over a division the fire needs a thorough cleaning. The method employed is to push the live coke from the back to the front half of the grates and remove the clinker from the former. It will usually be found to have formed a solid mass through which, in its cooled condition, no air could be forced. A few moments, however, before reaching the terminal, while the engine is working and the firebox hot, there seems to be an abundance of air streaming up through the bed of fuel. The inference is that, when in this condition, the clinker on the grates is in a plastic or semi-fluid condition soft enough to allow the air to bubble up through it. When cooled and removed, it comes out in large slabs from 1 to 2 in. in thickness. After cleaning the back half the coke is drawn back and the front half cleaned in the same manner. The engine is then allowed to stand with the bared grate until taken out for another run.

When properly and intelligently handled, then, the quality of coke that we have been considering is an efficient and reliable fuel for locomotive purposes. The advantages resulting from its use are first, cleanliness; and second, freedom from spark throwing. There is no smoke, and no cinders, and this is a great element of its popularity. The regular travelers on the two roads burning coke are quick to detect the substitution of a coal for a coke burner and promptly ask the reason for the change.

With a good grade of coke there is practically no spark throwing. One may watch the stack for miles on an express run at night where heavy firing is being done at 5-minute intervals and not see a spark escape. Occasionally, of course, a solitary spark will shoot into the air, but it occurs so rarely as to warrant the use of the word "never." Such a condition has naturally lessened the number of fires along the line.

As for the commercial aspects of the case, the probabilities seem to indicate that coke is somewhat more expensive than coal, but the difference is slight. But whether it is or no, it would undoubtedly be a difficult thing to discontinue its use, as such action would be followed by an overwhelming volume of complaints from patrons of the road and residents along the line. From the standpoint of the motive power department, there are still some improvements to be made, such as a regulation of the draft so as to avoid the excessive escape of steam while standing at stations and the securing of more complete combustion by the burning of the carbonic oxide and other gases that now escape. When this is done the quantity used will probably show a marked decrease. While the clinker accumulates in considerable quantities on a run of a hundred miles, there seems to be no reason why a division of 150 miles could not be covered, though the fire would be in bad condition at the end.

The locomotive reports of the Boston & Maine show that the rate of consumption per passenger car mile is 20.65 lbs., as against 14.70 lbs. of coal, and that the mileage per ton of coke is 32.60, as against 30.90 for coal. No attempts have, thus far, been made to use the fuel on freight trains, and it will undoubtedly be some time before it will be available for that purpose as the physical difficulties of carrying sufficient quantities will be very great.



Smoke and Spark Destroyer.

A Smoke and Spark Destroyer.

In the accompanying illustration is shown a device made by the Smoke & Spark Destroyer Co., of Philadelphia. It is said that careful experiment during nearly three years, by the mechanical engineer of this company, has demonstrated the usefulness and reliability of this device.

It is apparent from the drawing that the exhaust is carried up from the engine saddle through a Y-shaped pipe, which maintains a separate exhaust from the cylinders until an exhaust head surmounting the members of the Y is reached. This head, which is described as embodying the principle of a vacuum exhaust, is circular and is fitted with a cap constructed in the manner shown, having numerous corrugations within it. In each corrugated space a hole is drilled for the discharge of the exhaust steam. The further passage of the exhaust to the smokestack is obvious from the illustration. The appliance requires no extra induction jets and no alteration of the firebox. It can be substituted, usually, for the ordinary exhaust pipe without change at the saddle joint, and requires little or no change in smokestack, netting or diaphragm.

The claims made by the manufacturers are that by its use this vacuum exhaust head destroys smoke, prevents throwing of sparks, acts as a muffler of the exhaust and saves fuel. It is said that orders have been received from a number of railroads and that the makers are prepared to refer to those who have placed orders for evidence of practical results.

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EDITORIAL ANNOUNCEMENTS

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

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On Saturday last it appeared that many of the exhibits at the Saratoga conventions would not be in place on time, largely on account of the more elaborate displays this year. But by Monday night the work of installing was practically finished. The perfect weather contributed much to the success of what has become a very important feature of these meetings. In fact, the Convention exhibits are now a fairly good index of present practice in the mechanical departments, and the lines along which men are working and thinking. As an instance, only a few years ago pneumatic tools were first shown in a modest way by a single company; this year several companies have great assortments of these tools. The same may be said of large capacity cars and trucks, especially those of steel. Car lighting apparatus this year has a more prominent place than ever before and the exhibits show the progress made in lighting cars by Pintsch gas, by electricity generated from the axle, and by acetylene gas. Improved draft gear for freight cars is also shown, indicating that more are working on this problem. On the whole, this feature of the convention this year is well in advance of past years and is truly instructive; it must also be said that the members now study rather than merely inspect the exhibits.

The compilation of railroad gross earnings for the month of May was published last week by the *Financial Chronicle*. Reports from 120 railroads, aggregating 102,350 miles, show gross earnings for May, 1900, of $56,009,701, against $50,607,713 by the same companies on 100,413 miles for the corresponding month last year. This is a gain of $5,401,988, or 10.67 per cent., and this increase follows large gains of preceding years. The increase for the month in 1899 over the same month in 1898 for a somewhat smaller mileage was $3,059,323. In 1893 it was $5,744,201, following $1,942,782 in 1897 and $834,634 in 1896. In this increase the Baltimore & Ohio leads with $702,047, or 29.8 per cent. over the receipts of a year ago, with no change in the mileage. Then follow the Northern Pacific, $472,507; the Illinois Central, $365,210; the New York Central, $327,061; the Mexican Central, $309,376; the Great Northern system, $269,126, and the Canadian Pacific, $236,849. Only two roads show decreases larger than $30,000, the Toledo, St. Louis & Kansas City, $30,856, and the International & Great Northern, $30,264. The May, 1900, earnings of 11 roads of the Southern group were $9,179,913, which is $516,395 over those of a year ago. The 13 roads of the Northwestern and North Pacific group report $13,241,198 earnings, a gain of $1,197,900 over last year. The 18 roads of the Middle and Middle Western group show an increase of $840,208, the 10 roads of the Southwestern group $456,974, and the six trunk lines $771,045. Attention is called to the fact that these gains are made in the face of smaller grain and live stock movement in the West, and a small cotton movement in the South. The receipts of cotton at the Southern outports in May of this year were only 129,809 bales, against 201,973 bales in May of 1899. The shipments over land were only 50,285 bales, against 91,294 last year. With the single exception of barley there was a falling off of all grain receipts for the five weeks ended June 2, as compared with the corresponding period last year, the total contraction being nearly 10 million bushels. A considerable portion of this loss was at Chicago. At that point for the 31 days of May this year the receipts of grain were only 13,065,989 bushels, against 17,228,630 in May, 1899, and 30,186,069 bushels in 1898. But two years ago receipts were augmented by the Leiter wheat corner. The deliveries of live hogs at Chicago were 740,911 head in May, 1900, against 787,216 in 1899, and of all kinds of live stock 24,029 carloads, against 25,039 carloads last year.

In Rhode Island every railroad company is now required to have a gate, flagman or other suitable "precautionary measure or appliance" at every highway crossing where the state railroad commissioner shall deem such protection necessary for the safety of the public; though the decisions of the commissioner are subject to review by the Supreme Court. This is the requirement of a law just passed. Rhode Island is but a small part of the map of the United States, but a principle is independent of area or bulk, and even in Rhode Island there will no doubt be some critics who will call this statute an invasion of the right of local self-government. The fundamental principle that the highways of each town shall be managed by the officers of such town is one which citizens are generally decidedly averse to modifying in any way, except where they can see a prospect of direct financial advantage; and the question whether safety requires an attendant or an audible warning apparatus at a railroad crossing comes within the general subject of highway management. But in view of the great cost of guarding crossings and the difficulty of negotiating concerning this matter with most town officers, it is likely that every railroad superintendent in Rhode Island will be glad that this law has been passed. The question whether, at a certain crossing, the absence of all warning of the approach of trains should longer be endured is at best a hazy one and usually difficult to determine; and it will therefore be a gain—probably would be a gain in any State—to have the interests of all cities and towns entrusted to the hands of one man or one state board of few members. A state commissioner, knowing the conditions at scores or hundreds of crossings can almost surely judge of any particular case, in some of its aspects, better than town officers can, so that putting the matter in his hands is likely to prevent much friction. A state officer will not neglect the interests of a town, while at the same time he can appreciate the burden on the railroad company.

An attendant or a bell at a crossing is in one sense a luxury, and railroad officers are hardly to be blamed for looking on the expense as a burden. In making this assertion we have in mind those crossings yet to be equipped. All the busiest grade crossings may be assumed to be already supplied with gates, flagmen or bells. Thousands of the less important crossings must wait for years before anything can be done for them. In the class between these two are hundreds of crossings which are somewhat dangerous but which cannot be watched 24 hours a day—or even 12 hours—without driving into deeper poverty a railroad already poor. By all considerations of equity the wayfarers using such a crossing should look out for their own safety rather than ask the railroad to increase its expenses when it is making little or no profit. In some cases a town will ask for gates where the business of the railroad is so light that in justice to all concerned it ought to refuse the gates and reduce the speed of trains instead; but reducing speed is as unpleasant for the public as for the railroad, so the difficulty is not completely cured in that way. Reducing speed would be the normal remedy at many crossings, and it is a remedy always available almost everywhere; but, of course, no one is willing to adopt it. We all want the luxury of fast time even on a thin railroad. After balancing these various perplexities an impartial state officer is likely to find himself deciding crossing problems largely on the basis of what the railroad has done at other places and of the amount of money it appropriates to this purpose year by year; in short, what the railroad can afford. A state officer is, therefore, better qualified than a town officer because he has the information which will enable him to take a broader view.

The Proposed International Standard Specifications.

Among the many topics to come before the Master Mechanics' Association for discussion will be some of the specifications proposed as standard by the American Branch of Committee No. 1 of the International Association for Testing Materials. These specifications have been published at much length in the *Railroad Gazette*, together with the voluminous tables which compare the specifications of a number of different companies. They have also been distributed in pamphlet form by the committees. Therefore, there is no reason why those who wish to discuss the matter should not have the information in their possession. We assume that the Association will at least have something to say about boiler plates and about forgings for locomotives. Certainly this is to be hoped, for it is important that the committee should have the benefit of the opinion and criticism of those who are qualified to judge. The valuable paper by Mr. Condron, which appears elsewhere in this issue, suggests a number of points that may well be taken up, and we venture below to suggest a few others, not by way of expressing any opinion, but as indicating some definite points of attack.

It has of course been noticed that the committee uses the term "yield point." In this the example of the committee of the American Society of Civil Engineers has been followed, but the propriety of the term is questionable. The much older expression, "elastic limit," is well understood, and whether or not it is a precise term, the matter was quite thoroughly discussed some years ago with the general result in favor of retaining the older term. Apparently, the committee found that "yield point" would not answer in all cases, as, for instance, in the specifications for forgings, where they use elastic limit. Possibly this may have been in deference to the requirements of the U. S. Navy. The method of checking the yield point or elastic limit by the drop of the beam is not clearly defined, and if this value is to be observed provision ought, we should say, to be made for the use of a pair of dividers in checking the elastic limit. If this is not done a wide range of results can be got by speeding up the machine. Concerning this Mr. Condron has a valuable paragraph.

Again, in specifications for forgings and other material would it not be better to fix a high limit for the ultimate strength as well as a low limit? It will be observed that in a number of the specifications proposed the minimum limit only is used. We suggest that it would be better to use the high limit, making the range as broad as may be necessary, considering the class of material under test, instead of relying on reduction of area and percentage of elongation to check hardness.

On the whole, the specifications for forgings are good reference specifications, but seem to be too general for use in many special cases. It might be better to divide them, making distinct specifications, for instance, for locomotive forgings; and in like manner the specifications for material for bridges and ships might perhaps better be divided.

No provision has been made for high boiler steel, high bridge steel or low steel for eye-bars, and yet such grades are in use. It would seem to be proper to have these points discussed with some care and to determine whether or not the advantages are enough to justify the use of these grades of steel and the objections to them.

No location is specified from which drillings are to be taken for analysis, but it is plausible at least to say that we ought to have the information given by drillings taken from the center of the piece to better determine the actual segregation, especially where large ingots are used. This matter of segregation is one of the tough phases of the metallurgy of steel, but that is no sound reason why it should be ignored in tests. If this point is not taken up by the Master Mechanics it will possibly have particular attention at the August meeting of the Mining Engineers. They may well carry further now their valuable discussions on the physics of steel and bring their scientific information up to date and make it available for manufacturers and engineers.

It has often been shown that the tensile test does not always indicate the true character of a piece of steel, and it might be well to use some simple shop test to check brittleness, and this leads to a point concerning the rail specifications. Why should only one blow in every five be tested? The drop test is so simple and inexpensive that it would seem better to subject each blow to this test, which is the best check that we have on brittleness due to high finishing temperature in rolling.

The Reports of the M. C. B. Association.

For the convenience of busy men we will attempt a brief summary of the M. C. B. reports to be found elsewhere in this issue. The reports are up to the average of recent years but none of them stands out

prominently, as did, for instance, last year's coupler report, or other notable papers of the past which might be mentioned. Such subjects of general interest as draft gear, center plates and side bearings, where there is an opportunity for original study, warrant more careful treatment than they have received this year and they may profitably be taken up again with a view to bringing out experimental data. Going over the reports one gets the impression that a great deal of routine work has been done, which is of the highest importance to railroads, but it does not make good summer reading, or promote discussion. On the other hand, the reports of special committees are few in number and a trifle weak; they show signs of hasty preparation and a tendency to use too freely disjointed replies from circular letters. As in some other societies, the circular letter business is over done and its chief recommendation seems to be that it supplies a favorite form of padding. The really good committee work is done when one or two zealous men bring to bear their own labor, thought and experience. In nine cases out of ten the mere collating of answers to circular letters is inconclusive and confusing; often it is misleading.

The Arbitration Committee has rendered 32 decisions, which is three less than last year. Further it may be interesting to know that in 1898 there were 67 decisions, then 95, 62, 56, 51 and 63 in 1893. It is a matter of comment that the Interchange Rules for freight cars are now giving very general satisfaction, and there seems to be a disposition on the part of the Arbitration Committee to leave well enough alone, and very few recommended changes in the rules (and no important ones) have the approval of that committee. It would therefore seem that besides a revision of the prices in the M. C. B. rules, which is covered by a report of a special committee, the Interchange Rules for freight cars will essentially be unchanged. The code covering the interchange of passenger cars has been revised by a special committee and the whole matter put in better shape. The same may be said of the rules for loading long materials.

The standing committee having supervision of the standards and recommended practice, in connection with several matters of detail, suggests that members consider a reduction in the percentage of carbon specified for steel axles, as such a reduction is in line with good practice. It also suggests that the subject of air-brake tests be assigned to a special committee for next year, which is probably the best way to handle it. The standing committee on that subject has so far been unable to make tests and this year has no printed report. Also, the standing committee on brake shoes has made no tests during the year.

The coupler committee has completed the design of a drop testing machine and submitted the detail drawings. It is expected that such a machine will be built at Purdue University during the next year. Arrangements have been completed with the Pratt & Whitney Company to make the worn-coupler gage and the contour gage approved last year, and roads can now supply themselves with these gages. The committee is experimenting with the twist gage, but does not as yet feel warranted in placing this gage in the hands of a manufacturer. A label to be cast on couplers similar to that used on air-brake hose was recommended so that records can be easily kept of the life of couplers. The other question considered was increasing the dimensions of the coupler shank, but this is found to cause such radical changes in the standard spacing of center sills and the size of draft timbers that no definite recommendations were made. However, it is thought that the use of metal draft beams and steel center sills will eventually permit of an increase of the coupler shank without interfering with other parts.

As rather coming under the head of routine work, there may here be mentioned the improved wheel circumference measure, shown elsewhere, which was proposed by the committee on that subject; doubtless it will be adopted in place of the present measure. Also, journal boxes, wedges, etc., for 80,000-lb. and for 100,000-lb. capacity cars were presented by another committee and these have the advantage of interchanging with the boxes used on practically all the cars of those sizes built up to now.

On subjects of a more general nature two special committees failed to make reports, the subjects being freight car springs and metal dead blocks and safety chains. Another committee, that on air-brake appliances, made a very brief report, merely calling attention to the use of unnecessary angles in train pipes, and the common neglect in caring for triple valves and brake cylinders. It suggested, however, that future committees take up the subjects of slack adjusters, additional braking power on large capacity cars and specifications to cover brake beams for such equipment.

The committee on side bearings recommended that 60 in. be adopted as the proper location of side bearings from the center, and that the distance between the top of the bottom side bearing and the bearing surface of the bottom center plate should be fixed. However, it did not have enough data to determine a suitable vertical distance. It was considered that the clearance between the side bearings with metal bolsters should be from ¼ to ⅜ in., and with wooden bolsters from ½ to ¾ in., on account of the greater deflection. It was thought from tests, given in the report, that advantages arising from the use of roller side bearings would not be worth the additional cost, especially on freight cars, and the committee was not able to satisfy itself that roller bearings had been sufficiently perfected to insure better results than were obtained with the present plain bearings. Some of the latter conclusions, however, can be questioned and will be taken up at another time.

The report on center plates is chiefly of interest as showing the wide difference in practice in the matter of center plates and a preference is shown by the committee for center plates having flat bearing surfaces designed to carry about 400 lbs. per square inch. An interesting statement is that in a number of trials of cars run over an 18-degree curve, it was observed that the center plates did not move one on the other, but that the adjustment of the wheels to the curve took place through the springing of the arch bars and through the lost motion about the boxes.

The committee on draft gear concluded that the ordinary M. C. B. draft rigging has insufficient spring capacity, and further that the attachments to the draft sills are not strong enough, but the members of the committee disagreed as to the best form of rigging, and were not prepared to submit a design. The chairman preferred an arrangement of tandem springs resulting in short follower plates, while the other two members of the committee preferred the twin spring arrangement as then the present M. C. B. yoke could be used. All, however, favored malleable iron draft beams bolted direct to the car sills and suggested that tests be made of the capacity and efficiency of modern forms of draft rigging. Such tests, if they are ever made, will doubtless bring out the importance of providing against the sudden recoil of the springs; something the committee did not see fit to discuss.

Pure Water for Locomotives by Evaporation.

The purification of water for locomotive boilers has proved a subject of abiding interest.[1] Its importance increases with each increase in the size of locomotives, and with each change which tends to make more exacting the condition under which they operate.

Chemical treatment has in the West done its full share to make possible the present day achievements in locomotive operation, but as the result of such treatment, even under favorable conditions, is partial, it is not out of place to inquire whether roads will not soon find it advantageous to resort to distillation. The great advantage of distillation, as compared with chemical processes, is to be found in the fact that it yields water which is practically pure. The subject is not a new one. It has often been discussed and was touched upon by a committee of the Master Mechanics' Association which reported last year;[2] the conclusion being, however, that the cost of distillation would be greater than any possible saving which could result therefrom. But this was a year ago. Distilling apparatus is undergoing rapid development. Better results can now be had than those which were made the basis of the committee's estimate and still better results are to be looked for in the future. Whenever it can be shown that water can be distilled at a cost not greater than that which, under present practice, arises from the presence of impurities in untreated water, the matter becomes one of promise and, hence, merits attention.

Distilling plants of large capacity are now regularly employed in distilling ships of the United States Navy,[3] drawing their supply from the sea and delivering fresh water for all purposes, including use in boilers. Similar apparatus is in use in the naval water-supply station at Dry Tortugas.[4] These "triple effect evaporators" consist of several simple elements connected in series by suitable piping. They are not complicated or otherwise objectionable, and they can be depended upon to deliver from 20 to 36 lbs. of pure water, for each pound of coal burned, the exact amount depending upon the nature of the apparatus and the quality of the fuel. Again, a British firm[5] advertises distilling apparatus capable of producing 44 lbs. of pure water for one pound of coal. Such results are of the highest significance though there is no theoretical reason for accepting them as maximum and it is but reasonable to suppose that better ones will be forthcoming.

A locomotive must be supplied with, let us say, from 4 to 5 lbs. of water for each pound of coal burned. Its evaporative efficiency is often greater than is implied by this statement, but as the conditions of service are frequently unfavorable to high performance, and as considerable portions of the total coal are consumed in firing up and in keeping the engine warm while standing, the values given may be accepted as representing safe limits. With a distilling apparatus yielding from 40 to 50 lbs. of water in return for an expenditure of fuel, which if burned in a locomotive would result in the evaporation of but 4 or 5 lbs., it is evident that any road could supply a locomotive with pure water at a cost for fuel of one-tenth that necessary to supply fuel to a locomotive thus operated. That is, a road having ten engines can supply them all with distilled water, by the expenditure of an amount of fuel equal to that consumed by any one of them. This, of course, is not the whole story, but so far as it goes it is true.

A more complete investigation of the problem should involve an estimate of the saving which would result if distilled water were substituted for natural water. The amount of such saving would naturally depend upon the character of the service performed by the locomotive, and upon the nature of the raw water. As these factors change with every change in locality, absolute values can not be given, but a review of the important conditions entering into such an estimate will be helpful. Thus, expense arising from the presence of scale-making impurities in the feed-water supplied to locomotive boilers, appears in losses occasioned by water blown from the boiler; in cost of labor and materials necessary for regular washing; in increased cost of repairs; in loss of time and, consequently, of mileage while engines are out of service for washing and for repairs; in loss of power occasioned by increased tendency to foam; in reduced evaporative efficiency because of accumulation of scale; in increased consumption of oil in cylinders, and doubtless in other though minor and less obvious ways.

A committee reporting to the Master Mechanics' Association in 1870 estimated that the annual cost of that part of the boiler cleaning, repairs, and loss in evaporative efficiency, which resulted from the presence of scale-making material in the feed-water amounted to $750. Since this estimate was made, locomotives have been nearly doubled in size and it would at first appear fair to assume that the estimate should be increased proportionally. Again, the mileage of engines in 1870 was not as great as now and the estimate should be further increased on that account. It would seem, therefore, that an estimate applying to a modern locomotive, based on data of thirty years ago, might exceed $2,000, to include all of these considerations. Such an estimate would probably not be too large if the feed-water practice of 30 years ago were still in vogue. But the adoption of chemical treatment, the resort to persistent blowing, and use of improved facilities for washing, have so well served their purpose that the cost arising from the use of natural water has not increased in the same ratio with the size of locomotives or with their increase in mileage.

The annual repair bill of a modern locomotive in the west, may, for our present purposes, be taken at $2,500, although this is an extremely variable figure. An examination of the annual reports of five large western and middle western railroads shows the item of repairs and renewals of locomotives all the way from $1,200 to $2,800 a year. If pure water were supplied to locomotives, expenditures on this account would be diminished, but by some amount which is difficult to fix. A Superintendent of Motive Power who has given the subject very careful attention, estimates the cost chargeable to the presence of scale-making elements in the water, under present conditions of service, to be not more than $350, or about 14 per cent. of the assumed cost of repairs. This, however, is not all. To get the whole saving which would result from the use of pure water, there is to be added to these figures the cost of chemical purification and of boiler cleaning incident to present practice. This for an engine, under average western conditions, may be taken as about $25 for chemicals, and $85 for washing, though these values may under exceptional conditions reach to $160 and $200, respectively. This makes the total money saving per engine, which

[1] "The Work of Railroad Men on the Problem of Pure Water for Steam Boilers," C. Herschel Koyl, *Railroad Gazette* March 23, 30 and April 6, 1900.

[2] "Report of Committee on the Best Methods of Preventing Trouble in Boilers from Water Impurities," Mr. A. E. Manchester, Chairman.

[3] "The U. S. Distilling Ship Iris," Cassiers Magazine, 1899.

[4] Description and report of test by R. H. Clark, U. S. N., Journal of American Society of Naval Engineers for February.

[5] The Mirrlees, Watson & Yaryan Co., Limited, Glasgow.

would result from the introduction of pure water, as shown by the foregoing figures, about $460 for fair conditions and $710 for very bad conditions. These figures perhaps fix the limits of the direct money return which would accrue from the introduction of pure water. They do not, however, completely measure the gain which would result from such a change. The locomotive is subject to loss of time for washing; to limitations upon its power, due to tendency to foam; to increased wear of valve rods and packing; to excessive demand for lubrication, due to solids in water carried over with the steam to the cylinders; to a certain lack of freedom in assigning engines to service because of the necessity to hold for washing or for boiler repairs; and to a disposition on the part of enginemen to cry "bad water" as a cover to many faults in practice or defects in service which, without the cover, would be exposed until remedied. These all have a money value. Thirty years ago their value was not great but under present day conditions it is considerable. The advantage to be derived from the use of pure water therefore is not dependent upon shop accounts alone.

With an actual money saving of from $460 to $710 and with admitted incidental advantages, it may be claimed that under conditions now prevailing in the middle west, a total annual saving approaching $1,000 for each engine is not an unreasonable expectation.

The cost of distilling water should include the cost of fuel, interest on cost of apparatus, repairs of apparatus, and labor. The cost of fuel necessary to distil a thousand gallons in apparatus having several different degrees of efficiency, is shown by the diagram, Fig. 1. Thus, with coal at $1 a ton and an evaporative efficiency of 10 lbs. of water per pound of coal, a thousand gallons of distilled water will cost 42 cents. This is such a result as should be expected by the direct condensation of steam generated in a first class boiler of the ordinary type. If the evaporative efficiency goes to 44 lbs. per lb. of coal, the cost per thousand gallons falls to 9 cents. The heavier lines of the diagram show conditions which are realized by existing apparatus; the lighter lines, conditions which are possible, but not yet reached.

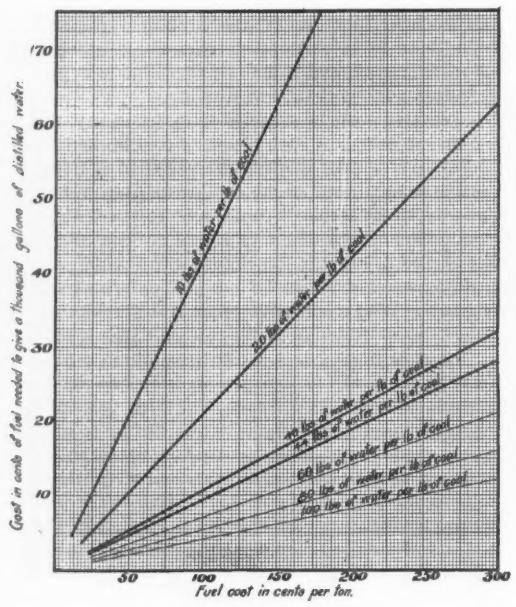

Cost in cents of fuel needed to give a thousand gallons of distilled water.
Fuel cost in cents per ton.
10 lbs of water per lb of coal
20 lbs of water per lb of coal
30 lbs of water per lb of coal
40 lbs of water per lb of coal
50 lbs of water per lb of coal
60 lbs of water per lb of coal
80 lbs of water per lb of coal
100 lbs of water per lb of coal

Fig. 1.—Cost of fuel necessary to distil a thousand gallons of water when the price of coal varies from 25 cents to $3.00 a ton, and when the efficiency of the apparatus is such as will give from 10 pounds to 100 pounds of water per pound of coal.

The whole cost of distilled water must include beside the fuel, the cost of attendance, of repairs and of interest charges on the distilling plant. Assuming that the fuel cost is but 75 per cent. of the total expense, the total cost per thousand gallons is shown by Fig. 2.

A modern locomotive in the West, averaging all classes of service, makes, let us say, about 20 miles per ton of coal and runs something less than 40,000 miles a year; let us call it 40,000 miles as this average figure may be reached by efficient administration under reasonable conditions. Then each engine will consume 2,000 tons of coal a year. Assuming that the boiler gives an evaporation, under all conditions of service, averaging 4 lbs. of water for each pound of coal burned, the locomotive will need 8,000 tons of water. Assume 2,000,000 gallons a year, for the present purpose. Referring to Fig. 2 it will be seen that with coal at $2 a ton and with apparatus yielding 44 lbs. of distilled water per lb. of coal, each thousand gallons will cost 25 cents. The total cost of 2,000,000 gallons will therefore be $500. This, then, is the amount which, under conditions stated, will be required to supply a modern locomotive with distilled water for one year.

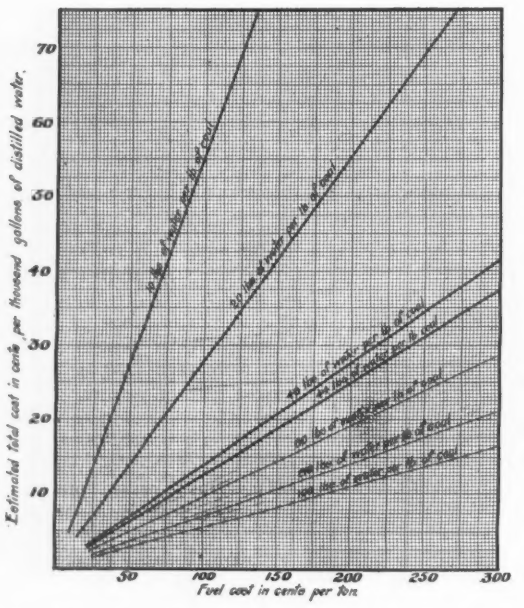

Estimated total cost in cents per thousand gallons of distilled water.
Fuel cost in cents per ton.
10 lbs of water per lb of coal
20 lbs of water per lb of coal
30 lbs of water per lb of coal
40 lbs of water per lb of coal
50 lbs of water per lb of coal
60 lbs of water per lb of coal
80 lbs of water per lb of coal
100 lbs of water per lb of coal

Fig. 2.—Total cost of a thousand gallons of distilled water, assuming the fuel cost to be 75 per cent. of the total cost.

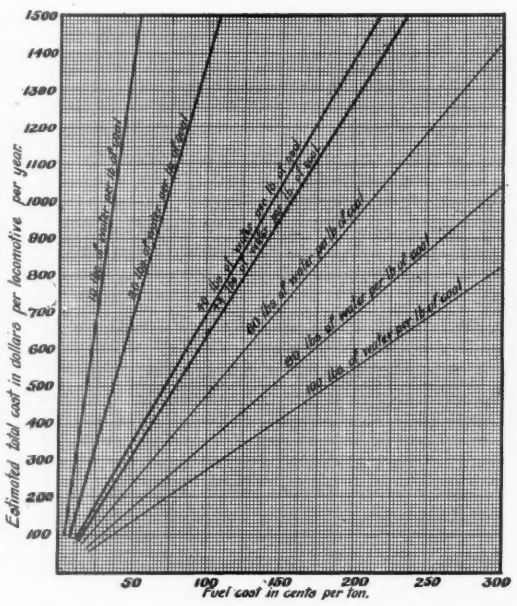

Estimated total cost in dollars per locomotive per year.
Fuel cost in cents per ton.
10 lbs of water per lb of coal
20 lbs of water per lb of coal
30 lbs of water per lb of coal
40 lbs of water per lb of coal
50 lbs of water per lb of coal
60 lbs of water per lb of coal
80 lbs of water per lb of coal
100 lbs of water per lb of coal

Fig. 3.—Total cost of supplying distilled water to a modern locomotive for one year, assuming the amount needed to be 5,000,000 gallons, and the cost of fuel to be 75 per cent. of the total cost.

Fig. 3 is drawn upon the hypothesis of 100,000 engine miles yearly run, 5,000,000 gallons of water and 5,000 tons of coal used per engine per year. Upon this basis, which is intended to meet the most ambitious operation for a long time ahead, the cost of supplying a locomotive with distilled water for one year is shown when coal varies from nothing to $3 a ton, and when distilling apparatus, having an evaporative efficiency varying from 10 to 100 lbs. of water per lb. of coal, is available. Values are based, as before, on the assumption that the fuel cost will be but three-fourths of the total cost of distillation. To apply the readings of Diagram 3 to a known engine mileage and fuel cost it is only necessary to read the lines at their intersection in the usual manner, accept the value in the column to the left, and reduce it to a proportion which is to the sum there given as the known mileage is to 100,000. For example: Known engine mileage is 50,000 miles yearly. On the 44 lb. distillation line, with coal at 200 cents per ton, yearly cost reads about $1,250, upon the diagram, 100,000 miles being the basis of calculation. Then 100,000 miles is to 50,000 miles as $1,250 is to $625, the total cost of supplying distilled water, one year, to an engine running 50,000 miles.

Comparing the costs thus obtainable from Diagram 3, with the saving which may fairly be expected as a result of the use of distilled water, which is from $500 to $1,000, it will be seen that the proposition is not a hopeless one. With the price of coal below $2 a ton, or with the efficiency of distilling apparatus but slightly increased beyond the present limit of 44 lbs., the argument becomes strong in favor of distillation.

The Erie Railroad now has, on its New York division (87 miles of main line and 120 miles of branches) a well-organized police force; and similar organizations are to be established on the other divisions. The plan of organization is similar to that which has been in satisfactory use on the Pennsylvania lines west of Pittsburgh for several years, and which was described in the *Railroad Gazette* of October 14, 1898. On the Erie it was found that not many new men were needed; the establishment of a police department consisted chiefly in organizing under one head all of the watchmen and other employees, already in the service, who were engaged principally in work of a police nature, and placing over them an efficient head. These 40 or 50 men will now work in harmony, with consistent purposes, instead of under a score or more different superiors; and with a chief officer who keeps constantly informed of what is going on along the lines of the company, and in the local courts, throughout the division, the individual police officers may be expected to do much more and better work than they have hitherto been able to do.

TRADE CATALOGUES.

Electro Pneumatic Interlocking.—This is the title of "Bulletin No. 4," of the Union Switch & Signal Co., Swissdale, Pa., which has just been issued. It is a handsome pamphlet of 48 pages, about 8 x 11 in., and the subject matter is made up chiefly of the description of the interlocking at the Boston Southern Station, which has recently been described in the *Railroad Gazette*. In addition to this there is a list of all the Westinghouse pneumatic interlocking plants installed by the company during the past 16 years, and including a half dozen or more now under construction. There is also a chapter on the principles involved in electro-pneumatic interlocking, with some discussion of the relative merits of high-pressure and low-pressure pneumatic apparatus.

The list of plants shows that there are now in service about 2,300 levers which operate nearly 2,000 electro-pneumatic semaphore signals, besides switches. In addition to this interlocking there are now in use in this country more than 2,600 automatic block signals worked by electro-pneumatic apparatus. The 72 interlocking plants are on the following roads: Boston & Maine (1894), 2; Chicago, Burlington & Quincy (1891), 2; Chicago & Northern Pacific (1891), 2; Chicago & Northwestern (1893 and 1899), 10; Grand Trunk (1892), 2; New York Central (1891-1895), 7; Pennsylvania (1891-1900), 28; Philadelphia & Reading (1893), 1; Southern Pacific (1885-1900), 7; St. Louis & San Francisco (1895), 1; Boston Terminal Co. (1899), 3; Chicago & Western Indiana (1893), 1; Terminal Railroad of St. Louis (1894 and 1899), 3; Union Depot, Kansas City (1890), 1; Union Railroad, Pittsburgh (1899), 2.

Hoisting and Conveying Machinery.—The Lidgerwood Mfg. Co., 96 Liberty St., New York, has issued a new catalogue of 195 pages, with an index and numerous illustrations. This is designed particularly to describe the Lidgerwood cableway as employed in building docks, dams, canals, etc., also for mining, logging, discharging vessels and transferring cargo between ships at sea. Our readers must be so familiar with the great variety of ingenious apparatus built by this company that we only need now to call attention to the appearance of this new catalogue. A new design of radial traveling cableway is shown, in which the head tower is arranged to travel about the others, thus covering a wide area for excavating and for delivering concrete or other material. Of course, the new apparatus designed for coaling vessels at sea gets special attention.

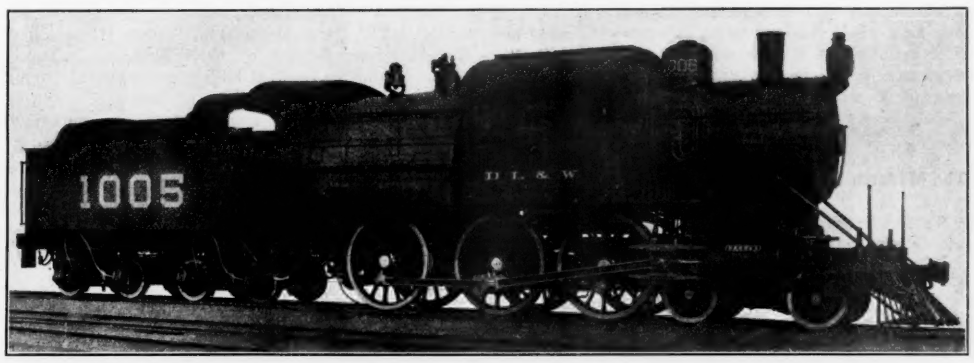
Pneumatic Tools.—In our issue of June 8 appeared a notice of the Paris Exposition edition of the catalogue of the Standard Pneumatic Tool Co., Marquette Building, Chicago. In that notice we expressed regret that the company had not considered it necessary to put the description of its apparatus into French and German. We are informed that this catalogue is published in French and in German for the Exposition, and furthermore, an edition is in preparation (perhaps is ready now) in the Spanish language.

Metal Sawing Machines.—The Q & C Co., Western Union Building, Chicago, have issued a special pamphlet describing their cold metal sawing machines. These include power-saving machines, portable rail saws and shop saws. Of course, they have adapted some of their machines to electric driving, as everybody must do now.

The Goodwin Car.—The Goodwin Car Co., 96 Fifth Ave., New York, also of Chicago and Boston, has issued a pamphlet showing the Goodwin dump car and some of its uses and advantages. The pamphlet is very intelligently illustrated and can not fail to be a weighty argument for the use of this car.

Heavy Ten-Wheel Passenger Locomotive—Delaware, Lackawanna & Western.

The Brooks Locomotive Works has built seven 10-wheel passenger locomotives for the Delaware, Lackawanna & Western which compare favorably in weight and boiler capacity with the recent 10-wheelers of the Lake Shore and Michigan Southern and Pennsylvania Lines. The accompanying engravings from a photograph and drawings show the appearance and principal features of construction.



Ten-Wheel Passenger Locomotive for the Delaware, Lackawanna and Western.

The Lake Shore 10-wheelers, described in our issue of November 10 last, have 133,000 lbs. on the drivers, weigh in working order 171,600 lbs., and have extended wagon top boilers with the firebox between the drivers and above the frame. These boilers carry 210 lbs. steam pressure and have 2,917 sq. ft. of heating surface, of which 223 sq. ft. are in the firebox; the grate area is 33.6 sq. ft.

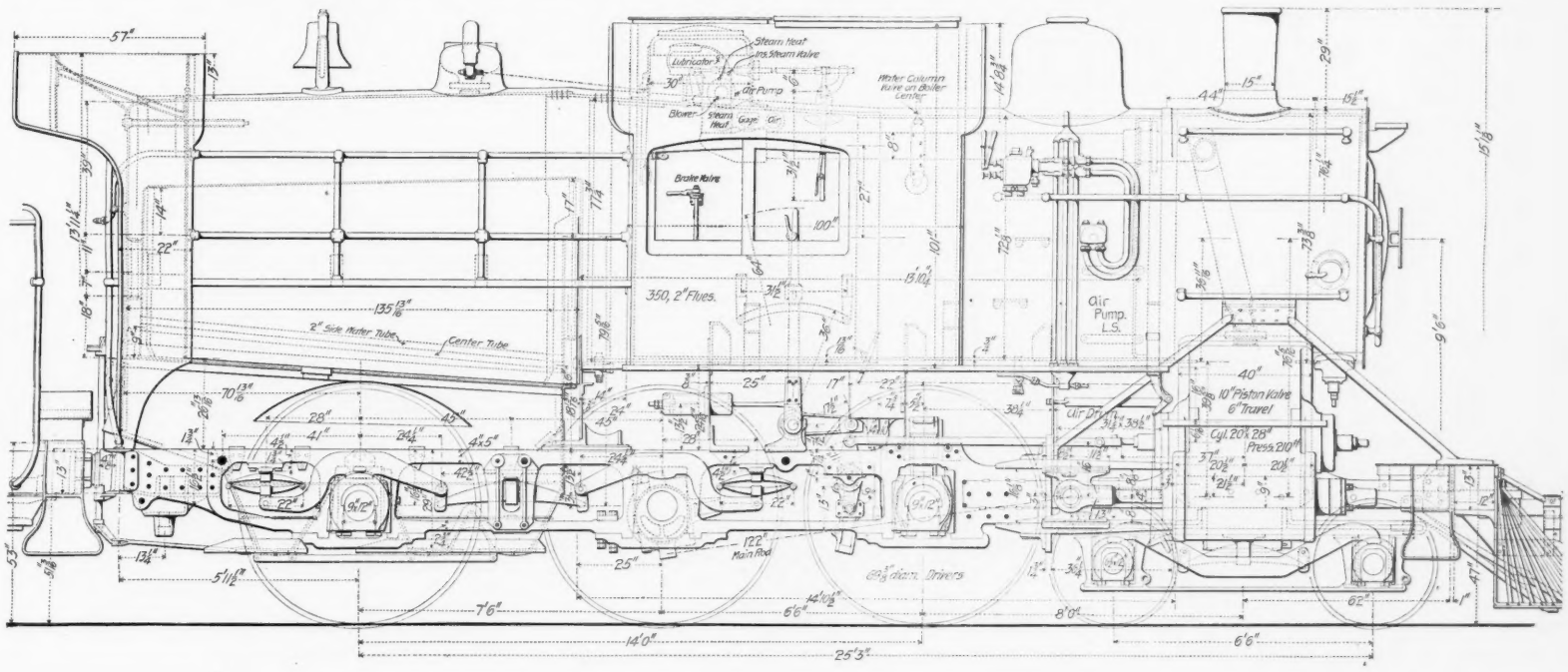
The cylinders are 20 x 28 in. and the driving wheels 80 in. in diameter. These dimensions are repeated, so that a comparison can easily be made with the new D., L. & W. engines which are more powerful on account of smaller driving wheels.

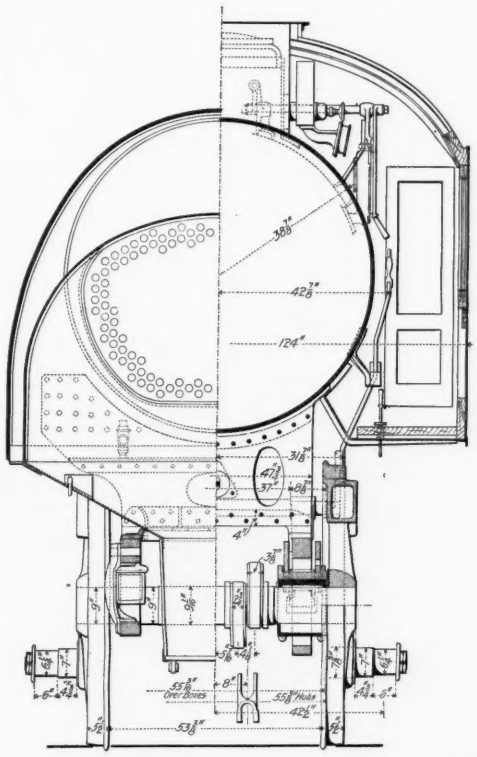
The D., L. & W. engines will burn fine anthracite coal and have 137,000 lbs. on the driving wheels, which are 69⅜ in. in diameter, and a total weight of 179,000 lbs. The cylinders are 20 x 28 in., the steam pressure is 210 lbs. and the boiler, which is of the wagon top type, has a wide firebox. The firebox heating surface is 180 sq. ft., that of the tubes 2,520 sq. ft., or a total of 2,700 sq. ft. of heating surface. The grate area is 84.2 sq. ft. It may be noted that the firebox is unusually large, 10 ft. 7 in. long and 8 ft. 1 in. wide, while the tubes are much shorter than in many recent engines, being 13 ft. 10¼ in. long. The valves are of the piston type, 10 in. in diameter. All the driving wheels have flanged tires and the journals of the driving wheels are 9 x 12 in. with 9-in. wheel fits. Particular attention has been given the cab arrangement and it will be seen from the drawings that the throttle, driver brake handle, injectors, gages, etc., are placed with reference to the convenience of the engineman.

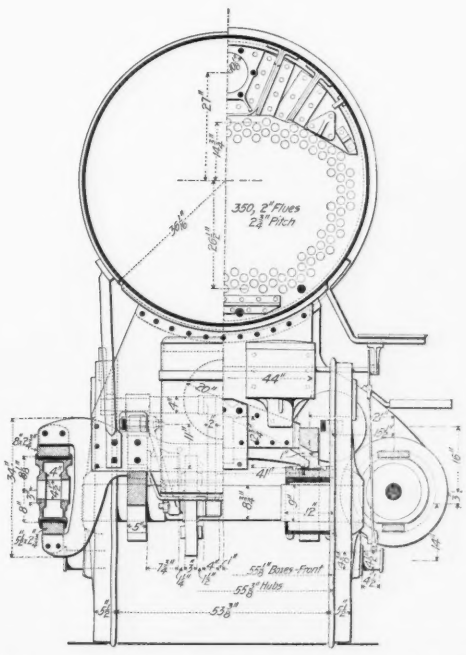
The tender loaded weighs 120,000 lbs. and has a capacity of 6,000 gallons of water and 12 tons of coal. The special equipment includes: American-Westinghouse driver brakes and Westinghouse air brakes for the tender and train service, Michigan lubricators, Consolidated safety valves, Hancock "composite" injectors, National springs and Jerome metallic packing for piston rods.

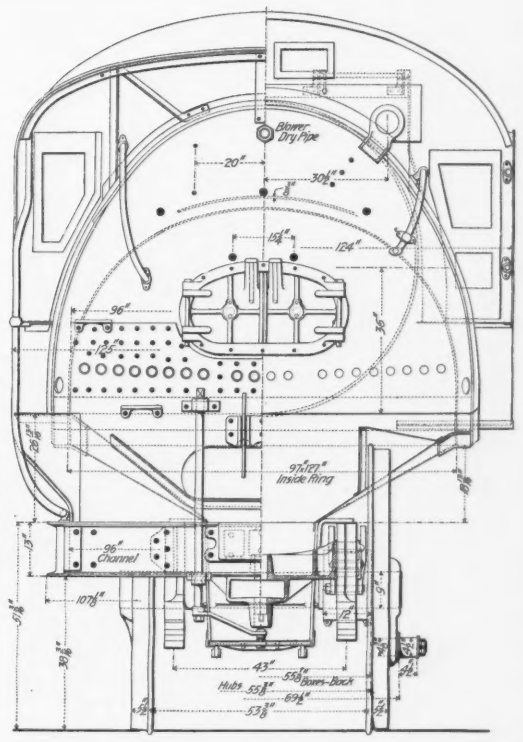
Other dimensions are:

Wheel base, total of engine	25 ft. 3 in.
Wheel base, driving	14 ft.
Wheel base, total, engine and tender	50 ft. 10¼ in.
Length over all, engine	38 ft. 3¾ in.
Length over all, total, engine and tender	60 ft. 10½ in.
Height, center of boiler above rails	9 ft. 6 in.
Height of stack above rails	15 ft. 1⅛ in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	36 in.
Journals, driving axle	9 x 12 in.
Journals, driving axle, wheel fit	9 in.
Journals, truck axle	6½ x 12 in.
Journals, truck axle, wheel fit	6⅝ in.
Main crank pin, size	6¼ x 6 in.
Main coupling pin, size	7 x 4¾ in.
Main pin, diameter, wheel fit	7⅜ in.
Piston rod, diameter	4 in.
Main rod, length, center to center	122 in.
Steam ports, length	20½ in.
Steam ports, width	2 in.
Exhaust ports, least area	75 sq. in.
Bridge, width	3¼ in.
Valves, greatest travel	6 in.
Valves, steam lap	1 1-16 in.
Valves, exhaust clearance	1-16 in.
Lead in full gear	1-16 in. negative
Boiler, material in barrel	Steel









Ten-Wheel Passenger Locomotive for the Delaware, Lackawanna and Western.

Built by the BROOKS LOCOMOTIVE WORKS, *Dunkirk, N. Y.*

Boiler, thickness of material in shell, ⅜, 13-16, ⅞, 5/8, and 9-16 in.
Boiler, thickness of tube sheet ⅝ in.
Boiler, diameter of barrel, front 72⅛ in.
Boiler, diameter of barrel at throat 77¾ in.
Boiler, height at back head 75 in.
Seams, kind of horizontal Sextuple lap

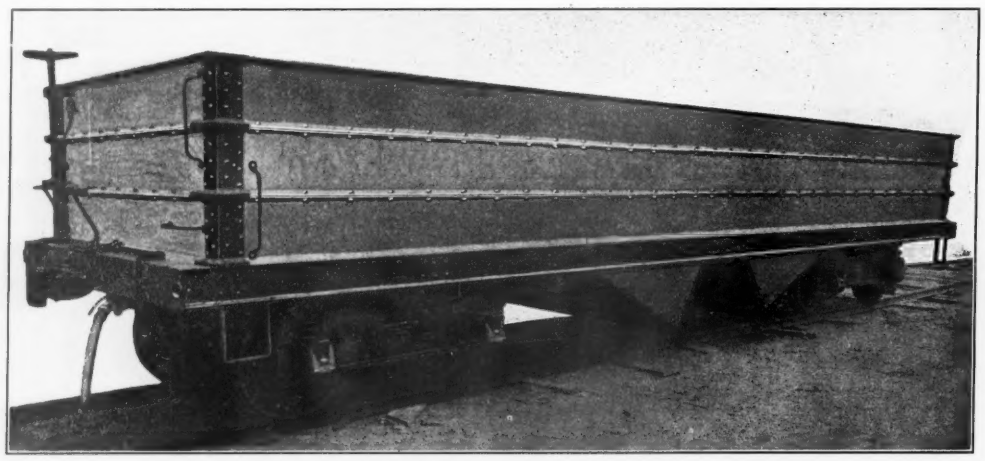
Seams, kind of circumferential	Triple lap
Crown sheet, stayed with	Radial stays
Dome, diameter, inside	30 in.
Firebox, depth, front	61 in.
Firebox, depth, back	50 in.
Firebox, material	Steel
Firebox, thickness of sheets,	Crown, 3/8; tube, 5/8; side and back, 5/16 in.
Firebox, brick arch	None
Firebox, mud ring, width	Back and sides, 3½; front, 4 in.
Firebox, water space at top	Back, 4½; front, 4 in.
Grates, kind of	Water tube
Tubes, number of	350
Tubes, material	Charcoal iron
Tubes, outside diameter	2 in.
Tubes, thickness	No. 3, 12 B. W. G.
Tubes, length over tube sheets	13 ft. 10¼ in.
Smokebox, diameter outside	73⅜ in.
Smokebox, length from flue sheet	68 in.
Exhaust nozzle	Single
Exhaust nozzle	Permanent
Exhaust nozzle, diameter	4⅞, 5 and 5⅛ in.
Exhaust nozzle, distance of tip below center of boiler,	1 13-16 in.
Netting	Plate
Netting, size of perforation	3-16 x 1½ in.
Stack	Steel, taper
Stack, least diameter	14¾ in.
Stack, greatest diameter	16⅝ in.
Stack, height above smokebox	29 in.

Tender.

Type	Eight-wheeled
Tank, type	"U" shape, with gravity slide
Tank, material	Steel
Tank, thickness of sheets	¼ in.
Type of under frame	Brooks 13-in. steel channel
Type of truck	Brooks, 100,000 lbs. capacity
Type of springs	Triplicate elliptic
Diameter of wheels	33 in.
Diameter and length of journals	5 x 9 in.
Distance between centers of journals	5 ft. 5 in.
Diameter of wheel fit on axle	6⅝ in.
Diameter of center of axle	5⅜ in.
Length of tender over bumper beams	21 ft.
Length of tank, inside	19 ft. 6 in.
Width of tank, inside	10 ft.
Height of tank, not including collar	60 in.

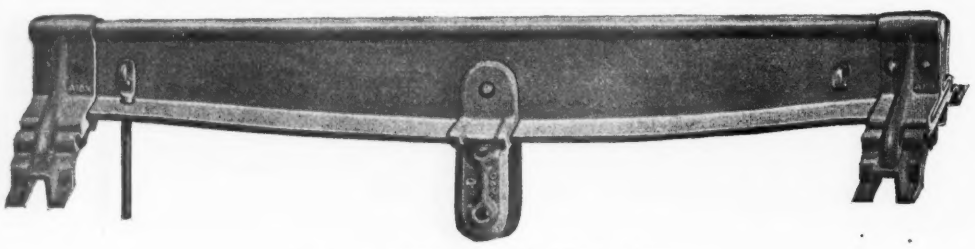
The Sterlingworth Rolled Steel Car.

A hopper-bottom steel gondola car, the sides and ends of which are made of 15-in. channels, bound by malleable castings at the corners and bolted at intermediate points, is one of the objects of interest at the Saratoga conventions. It is a product of the Sterlingworth Railway Supply Co., Easton, Pa. The building of this car and the development of the "New Sterlingworth Ideal" elliptic brake-beam, from rolled shapes, are steps in the advancement of the important line of manufacture of the Sterlingworth Company. Our readers are familiar with the rolled steel truck, bolsters and brake-beams regularly made by this company. The new car and brake-beam are illustrated herewith.



The Sterlingworth Rolled Steel Car.

The car is shown in general perspective from a photograph, Fig. 1. It is provided with the King hopper and, aside from that, is built under patents assigned to the Sterlingworth Company. The car was built to weigh 32,000 lbs., light, and to have a capacity of 80,000 lbs. It is fitted with Sterlingworth bolsters and with the new brake-beam shown in Fig. 2. When the facts are obtainable we shall publish further details of the design and construction of this car.



The Sterlingworth New Ideal Brake-Beam.

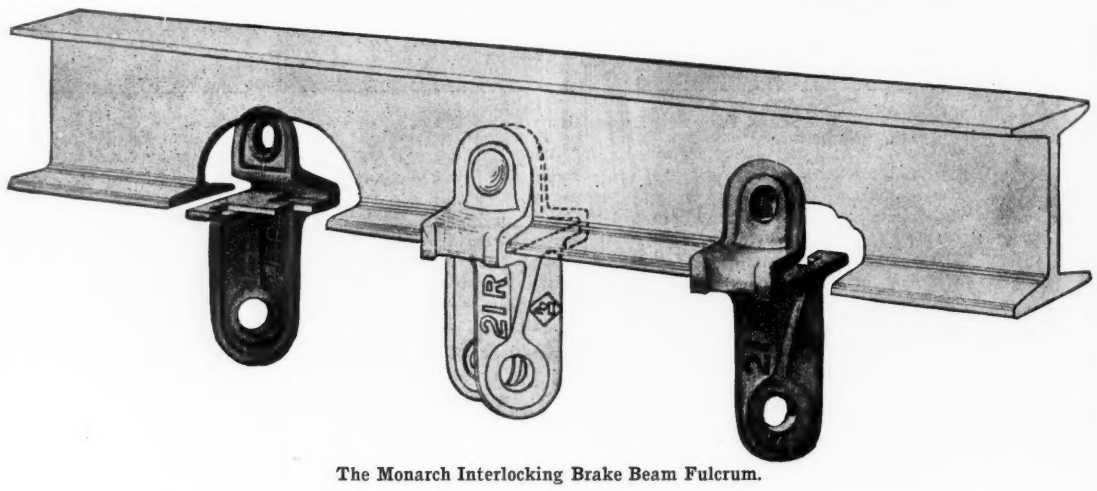
The plant of this company is the growth of about four years' business life. In that time it has steadily increased in size and importance as a railroad supply industry and now comprises nine buildings, conveniently disposed on about seven acres of ground, beautifully located upon the banks of the Lehigh River. The several divisions, rolling mill, foundry, annealing ovens, brake-beam, bolster and truck departments are a good example of what may be accomplished by systematizing production of parts and their assembling. The establishment is well equipped with special tools of modern design. The buildings are substantial, of brick, opening by liberal arches, one to another, where needful.

There are about 350 men employed. The good arrangement of trolleys and pneumatic tools, and the skilful disposal of working forces, make it possible to load some of the finished products into cars in waiting, while the metal is yet warm from the rolls. The extensive malleable iron department is especially interesting.

Taken as a whole the impression left upon the mind of a visitor familiar with such works is that of well directed energy, ample facility and the substantial establishment of a rapidly-growing enterprise.

The Monarch Interlocking Brake Beam Fulcrum.

Mr. T. E. Carliss, of the Monarch Brake Beam Co., Detroit, Mich., has patented a separable, interlocking fulcrum which will be used hereafter by that company in connection with the "solid" brake beam. The chief improvement, of course, lies in the fact that with the new fulcrum it can be easily removed for repairs without disturbing other parts and it will be seen from the accompanying engraving how the two parts interlock so as to make as substantial a connection as was had with the one-piece fulcrum. It is found, however, that there is a further advantage in that by the construction used the parts can be drawn in toward the web of the beam more closely than was possible where this casting had to be slipped on at the end. A single rivet is needed to keep the new fulcrum in place and in case of its removal it is only necessary to cut out this rivet. Brake beams fitted up in this way were shown at the Saratoga conventions.



The Monarch Interlocking Brake Beam Fulcrum.

The Proposed Specifications for Steel for Bridges, Etc.

BY H. B. SEAMAN, M. AM. SOC. C. E.

Various efforts have been made during the past fifteen years to obtain a specification which shall be uniformly satisfactory to both engineer and contractor, but it seems impossible to harmonize these apparently conflicting interests. In 1886 the Manufacturers' Association offered their "Standard Specification," but it contained clauses which engineers were unwilling to endorse, besides the fundamental objection, that specifications should emanate from purchasers or their engineers. These specifications, however, have had great influence upon what has been subsequently written.

Several years later (1889) a similar effort was made on the part of engineers, by the appointment of a committee on "Uniform Methods of Testing Materials," from the American Society of Civil Engineers. The work of this committee received little encouragement from manufacturers—was considered by a number of engineers to be an intrusion upon their professional work—and is not even accorded a place in the long list of specifications cited in connection with the present work.

The international movement originated abroad, but was quickly taken up by the interests here, and an "American Section" formed, which could make its work especially distinctive. The "Manufacturers' Standard Specifications" were first generally endorsed by motion, and later the number of engineers upon the committee was increased. The effort of the committee has been to modify the original specification so as to make it generally acceptable to all parties, but those who have been able to give the closest attention to the work were mostly allied to manufacturing and have naturally retained many of the characteristics peculiar to the original specification.

It is doubtful if any specification which is especially written from the standpoint of the manufacturer will be acceptable to the engineer, but the best features will be abstracted, and used in connection with other clauses and modifications which protect the purchaser, and insure the best material at reasonable cost.

Among the clauses of this specification which seem to merit engineering criticism is that permitting .06 per cent. phosphorous in basic steel. A majority of the specifications tabulated require phosphorous not to exceed .04 per cent. and in practice it is readily obtained at .02 per cent. or less. So long as manufacturers insist on such concessions, there is little encouragement for the co-operation of engineers.

The specifications for rivet steel, and for soft steel, are almost identical. Those given for rivet steel will produce a good quality of soft steel, and a better quality of steel for rivets may be obtained with an ultimate strength under 56,000 lbs. per sq. in. and an elongation of 30 per cent.

The original Manufacturers' Specification provided for a possible variation of 4,000 lbs. above or below the mean ultimate specified, and the committee, Am. Soc. C. E., accepted and adopted the same provision. The present specifications allow a variation of 5,000 lbs. Do the manufacturers retrograde under their own specifications?

The reason for the provision requiring eyebars to be made of medium steel, is not apparent. If an engineer should prefer to use soft steel, as generally more reliable —less affected by injurious heating, annealing or other manipulation—there is no reason why he should not do so. It may be an easy matter to produce eyebars of steel with less than 58,000 lbs. ultimate strength, which, without annealing, will fulfil the specification that not more than one-third the full-sized tests shall break in the head; provided, the latter were made with proper excess of material.

The provision against injurious seams, flaws and cracks would be improved by the omission of the word "injurious." All flaws may be considered injurious to bridge material, and the use of the word would cause quibbling.

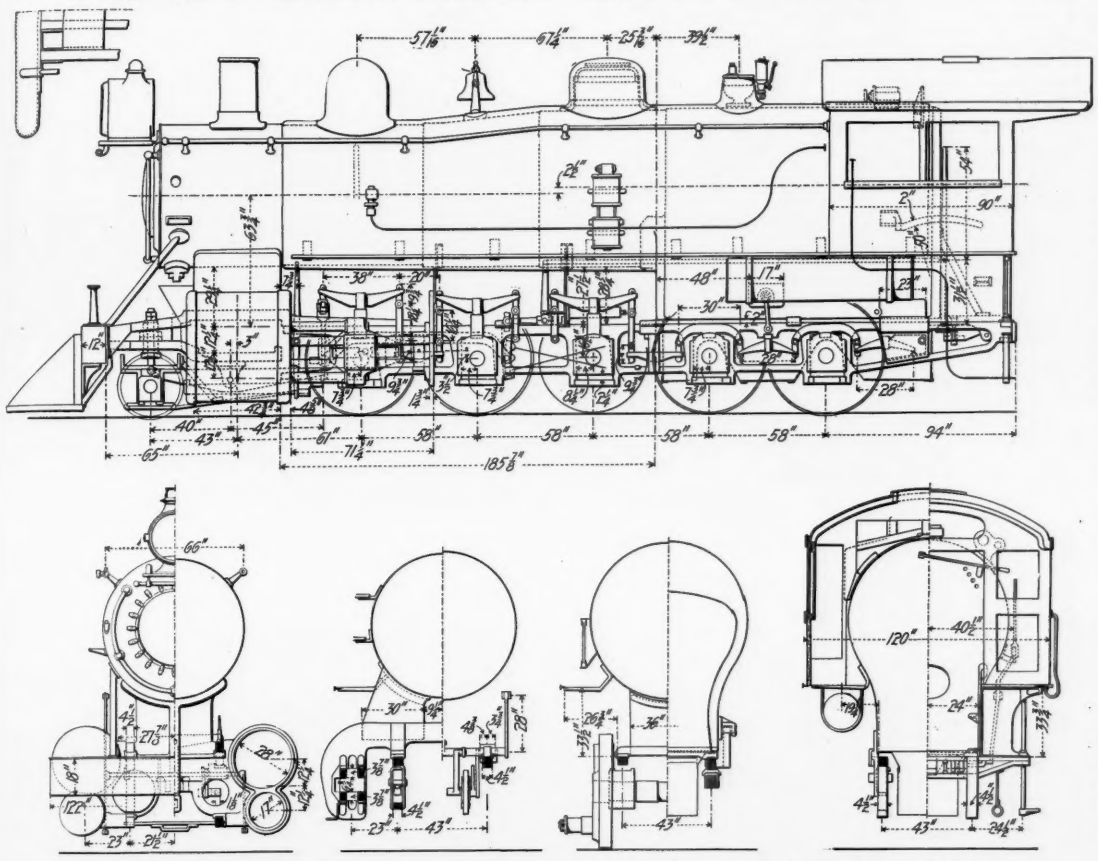
The clause which permits a variation of 2½ per cent. from the section specified, is reasonable for individual pieces, but provision should also be made that the section conform generally to the plans and specification, otherwise we may find the variations all on the side most advantageous to the contractor.

The clause requiring all tests and inspection to be made at the mill, is a precaution against abusive rejections after shipment, but does not protect against the shipment of defective material, whether by oversight or connivance. This is fortunately an instance where the better mills need no specification, but there are mills which do. Many mills are ready for a first-class specification, but others hesitate and ask more concessions. It would be unfortunate if the compromise with the latter should prevent high-grade results from the present committee.

Compound Decapod—Minneapolis, St. Paul & Sault Ste. Marie Railway.

The Baldwin Locomotive Works is building a compound decapod freight locomotive for the Minneapolis, St. Paul & Sault Ste. Marie which, in size, will compare well with other recent heavy engines. We are told by Mr. E. A. Williams, Mechanical Superintendent of the road, that this locomotive will be used between Minneapolis and Pennington, Wis., a distance of 165 miles. The ruling grade on that division is 42 ft. to the mile, one such grade being 10 miles long. The maximum grade is 63 ft. per mile, but it is not expected to haul the full tonnage over that grade without doubling. The decapod is expected to haul, when working compound, a train weighing 2,000 tons, exclusive of the tender and caboose, on a 42-ft. grade.

The total weight in working order will be about 214,000 lbs. and 190,000 lbs. will be on five pairs of drivers. The main driving journals are 9½ in. in diameter by 12 in. long and the others are 8½ x 12 in. The driving wheel base is 19 ft. 4 in., the engine wheel base is 28 ft., and the length of the engine and tender over all is 68 ft. 10 in. The tender loaded will weigh 120,000 lbs. and have a capacity for 7,000 gallons of water and 9 tons of coal, and the Westinghouse friction buffer will be used at the rear of the tender.



Baldwin Compound Decapod Locomotive for the Minneapolis, St. Paul & Sault Ste. Marie Ry.

The cylinders are 17 and 28 in. x 32 in., the driving wheels are 55 in. in diameter and the working steam pressure is 215 lbs. The boiler is of the radial stay wagon top type, 68 in. in diameter at the front and the firebox is 11 ft. long by 3 ft. 5⅛ in. wide; the depth of the firebox at the front is 77⅜ in., and 75⅞ in. deep at the back. There are 344 tubes, 2 in. in outside diameter and 15 ft. 7 in. long. The firebox heating surface is 201 sq. ft., the tube heating surface is 2,799 sq. ft., making a total of 3,000 sq. ft.; the grate area is 37.5 sq. ft. Piston valves are used having a travel of 5¾ in.

The special equipment includes Standard tires, steel main axles and all other axles Taylor iron; Detroit lubricator, Crosby safety valve, Leach sanding device, one Sellers and one Ohio injector, American-Westinghouse driver brakes, Westinghouse tender brakes, Sterlingworth brake beams, Lappin brake shoes, Utica steam gages, Jerome metallic packing for piston and valve rods and "Little Giant" blow-off cocks. Other dimensions are:

Gage	4 ft. 8½ in.
Fuel	Soft coal
Wheel base, total (engine and tender)	57 ft. 4 in.
Length over all, engine	45 ft. 6 in.
Height, center of boiler above rails	12 ft. 11 in.
Height of stack, above rails	14 ft. 7 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	30 in.
Journals, truck axle, size	6 x 10 in.
Main crank pin, size	6¾ x 7 in.
Piston rod, diameter	4½ in.
Main rod, length center to center	9 ft. 5½ in.
Steam ports, circular length	29¾ in.
Steam ports, width	1½ in.
Exhaust ports, length	29¾ in.
Exhaust ports, width	4½ in.
Bridge, width	3 and 2¾ in.
Valves	Balance piston
Valves, greatest travel	5¾ in.
Valves, outside lap	H. P. ¾ in.—L. P. ⅝ in.
Valves, inside lap	H. P. ⅛ in. negative—L. P. ¼ in.
Valves, lead in full gear	H. P. 0—L. P. ⅛ in.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	11-16 in. and ¾ in.
Seams, horizontal	Butt jointed with double cover strips
Seams, circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheet	⅜ in.
Crown sheet stayed with	Radial stays
Dome, diameter	32½ in.
Firebox, material	Steel
Firebox, thickness of sheets	5-16 in.
Firebox, with brick arch.	
Firebox, water space, width,	Front, 4 in.; Sides, 3½ in.; Back, 3½ in.
Grate	Rocking
Smokebox, diameter	69 in.
Smokebox, length	63½ in.
Exhaust nozzle	Double
Exhaust nozzle	Permanent
Stack	Straight
Stack, least diameter	16 in.
Stack, height above smokebox	2 ft. 7½ in.
Type	Swivel truck
Material in tank	Steel
Thickness of tank sheets	¼ and 3-16 in.
Type of under-frame	Steel channels
Type of truck	I beam bolster, arch bar
Truck with rigid bolster.	
Type of truck spring	Triple elliptic
Diameter of truck wheels	33 in.
Diameter and length of axle journals	5½ x 10 in.
Distance between centers of journals	77 in.
Type of truck bolster	I beam
Type of truck transom	Channel
Length of tender frame over bumpers	28 ft. 3½ in.
Length of tank	24 ft. 7 in.
Width of tank	10 ft.
Height of tank, not including collar	4 ft. 6 in.
Height of tank over collar	5 ft. 4 in.
Type of back drawhead	Westinghouse friction draft gear

TECHNICAL.

Manufacturing and Business.

The Kingston Locomotive Works, Kingston, Ont., will be sold at auction July 10.

Falls hollow staybolt iron is specified for 15 locomotives now being built for the Seaboard Air Line by the Baldwin Locomotive Works.

The St. Louis Car Roof Co. has been incorporated in Missouri, with a capital stock of $10,000,000, by Oliver Links, J. B. Case and L. R. Blackburn.

Charles T. Means, Superintendent of the Manchester Locomotive Works, has been chosen to represent New Hampshire on the National Republican Committee.

The Pearson Jack Co., of Boston, Mass., reports a steadily increasing business, especially with foreign countries. The company has lately received orders from abroad for a large number of its car replacing jacks.

E. N. Harley, President of the Standard Pneumatic Tool Co., will sail for Europe on June 30 on the steamer Lucania, combining business with pleasure. During the trip he will visit the company's exhibit at the Paris Exposition.

The Link Belt Engineering Co., of Nicetown, Philadelphia, manufacturers of link-belt elevators and conveying machinery, are building a large addition to their work-rooms, and also to the draughting department. New machinery has been installed and a number of additional workmen employed.

Within the last week the Atlantic Works, Inc., Philadelphia, have received an order from the W. R. Trigg Co., of Richmond, for one of their Futtock band saw machines and also an order for one to be used on the Pacific Coast, this last order having been received from Tatum & Bowen, San Francisco.

Falls Hollow Staybolt iron is specified to be used in locomotives being built by Rogers Locomotive Works for the Texas & Pacific, the International & Great Northern, and the Mobile & Ohio; also by the Richmond Locomotive Works for the Brainard & Northern Minnesota and by the International Power Co. for the Plant System.

E. W. Ash, who has been connected with railroads for the past thirty years, principally with the Philadelphia & Reading, and the Central of New Jersey, and for the last seven years General Manager of the Schuylkill Traction Co., at Girardville, Pa., has resigned from the latter position to act as Eastern Manager of the Atlas Railway Supply Co. He will make his headquarters in New York city.

After extensive tests of different electric heaters the officials of the Boston Elevated Railroad have placed the contract for all of the electric heaters to be used on the elevated road with the Gold Car Heating Co., of New York. This order includes, in addition to the elevated road equipment, an order for 150 sets of car heaters for surface cars. The elevated cars are to be fitted with the Gold standard electric heaters and the street cars will be equipped with the Gold panel electric heaters. This is one of the largest orders for electric heaters that has ever been placed.

For the past twelve years the firms of Robert W. Hunt & Co. and Hallsted & McNaugher, and the latter's predecessors, G. W. G. Ferris & Co., have been associated as Consulting Engineers, Inspectors of rails, structural and bridge materials, locomotives, cars, machinery, etc., each conducting their own business under their respective firm names. It has been decided to merge the two firms into one organization to be known as Robert W. Hunt & Co., the partners being Robert W. Hunt, John J. Cone, A. W. Fiero, James C. Hallsted and D. W. McNaugher. The firm's offices will remain at The Rookery, Chicago; Monongahela Bank Building, Pittsburgh, Pa., and No. 71 Broadway, New York.

Iron and Steel.

The Republic Iron & Steel Co. gives notice that on July 1 all the mills controlled will be shut down for repairs.

The price of steel beams in the Pittsburgh market has been cut $7 per ton, and the price of angles $9 per ton. The former price of both was $45 per ton f. o. b. Pittsburgh.

Chas. A. Kent was elected President of the Gaylord Iron Co. at Detroit, Mich., June 15. Frank B. Gaylord was elected Vice-President and Secretary, and Nicholas Woods, Treasurer.

At the annual meeting of the Illinois Steel Co. in Chicago June 13, K. K. Knapp was elected a director succeeding Morgan Rotch, and H. H. Porter was elected succeeding Marshall Field.

The St. Louis Blast Furnace Co. has been incorporated, with a capital of $200,000, by E. C. Cushman, J. D. Filley and C. A. McNair, and will take over the Missouri Furnace Co. of St. Louis, Mo.

Horace C. Disston, President of the Henry Disston & Sons Iron & Steel Works, Inc., Philadelphia, and Vice-President of the Henry Disston & Sons Saw Works, died June 13 at his home in Cecil County, Md.

It is announced that the National Steel Co., which recently put in operation its rail plant at Youngstown, O., has been taken into the rail pool which is now composed of the following companies: Carnegie Co., Cambria Iron Co., Lackawanna Iron & Steel Co., Pennsylvania Steel Co., Maryland Steel Co., Federal Steel Co. and the National Steel Co.

The Delaware Forge & Steel Co. has been chartered in Delaware, with a capital stock of $5,000,000, to engage, it is stated, in making armor plate. A location for a plant is reported as secured at the junction of the Delaware and Christiana rivers near Wilmington, Del. John Fritz is President of the company, and H. T. Wallace, of the Diamond State Steel Co. of Wilmington, is Secretary and Treasurer.

Steel makers are invited to bid until August 10 for furnishing 31,000 tons of the best face-hardened armor above five-inch in thickness, 60,000 tons armor treated by the present process, less than five inches thick, and about 1,150 tons of unhardened nickel steel armor for the U. S. Navy. Deliveries are to begin as soon as practicable after contract is let and continue at the rate of not less than 300 tons monthly.

Signals on the Reading.

The Philadelphia & Reading is to put in block signals on about eight miles of its Bethlehem Branch, from Fort Washington to Lansdale. Hall automatic block signals were put in between Fort Washington and Philadelphia last year, at about the time the upper part of the main line was equipped. A contract has also just been let for a new interlocking plant at West Falls, Philadelphia.

Automatic Coupler.

Effective July 1, the Southern Railway Co. will discontinue receiving freight cars not equipped with automatic couplers, except those moving in the direction of home. Beginning August 1, it will, in compliance with the law, decline to receive any car not so equipped.

Receiver for the Storage Battery Road, Chicago.

On June 13, Mr. Charles Henrotin was appointed Receiver for the Chicago Electric Traction Co., Chicago, which is the 30-mile road operated by storage batteries between Englewood and Blue Island. It is proposed to abandon the storage battery system and substitute the overhead trolley. After a trial of several years on this road the storage battery system has been found more expensive to operate on the main line than the trolley system, and where branch lines are at a distance from the recharging station the cost is much more. In the bill asking for a receiver, it is stated the storage batteries

are about used up and that a system of overhead trolley must be installed to prevent stopping the operation of the road and forfeiting the franchise and right-of-way.

Self-Propelling Air Hoist.

By making an air hoist which is supplied with power without the use of air hose the Pneumatic Crane Co., Pittsburgh, Pa., have greatly widened the field of air hoists in shops. The hoist is made to carry the man who operates it or to be operated from the floor. The construction involves the ordinary features of air hoists with necessary additions to adapt it to receiving a constant supply of compressed air obtained from a steel tube which underlies the I-beam trolley rack from which the hoist is suspended. This constant supply of air without the use of hose is obtained by the attachment of a sheath to the hoist. The sheath encircles the fixed tube which contains compressed air, and overlaps the several lengths of pipe and their couplings in which are fixed triggers or trip valves which are automatically opened as the sheath passes over them. The idea seems to be practical and is attractive. Some of the machines are now in successful operation.

Portable Electric Sand Sifter.

A convenient foundry improvement has recently been put on sale by Gould & Eberhardt, Newark, N. J. It is a portable electric sand sifter and mixer. The apparatus consists of a small motor, rotary sieves, etc., mounted on a hand truck, and readily attachable to current mains by contacts of the usual kind. The machine will do in two hours, worked by one laborer, the work previously done by two men in ten hours. There are many places in railroad plants where this economy could be effected.

Electrolysis From Street Railroads.

Certain English municipalities have been concerned as to the effects of electric tramways on their gas and water mains, but their city electrical engineers have reported to them that with the arrangements stipulated in the Board of Trade Electric Traction regulations properly carried out, trouble of this kind is very remote. The matter has just been considered by an Association of gas engineers and managers, the president of which read a paper expressing warm appreciation of the arrangements which have been adopted at Bristol to prevent electrolytic troubles. In connection with the lines now equipping there the tramrails are fished together with five plates, one on each side of the webb in the usual manner, one covering the entire under side, and two strips on the upper side of the flange of the rail, bolted up with 14 bolts. The rails are double bonded at each joint with copper bonds, electrically connected to the webs of each rail. There is also a third electric connection formed by an Edison plastic bond, fixed between the rail and the fish-plates. In addition to these bonds, and in order to make certain of one continuous conductor, a double cross copper bond is fixed at 120 ft. intervals. The electric bonding arrangements are costing the Tramway Company as much as 7s. per single joint, and altogether there are some 40 miles of line. A negative booster has been introduced in connection with the tram rails to make them the way of least resistance. The Board of Trade regulations stipulate that the current passing from the earth connections through the indicator to the generator shall not at any time exceed either two amperes per mile of single tram line or 5 per cent. of the total current output of the station. The greatest difference of potential allowed during the working of the tramway between the points of the uninsulated return furthest from and nearest to the generating station is seven volts. As a matter of fact, at Bristol the greatest difference does not now exceed 2 to 3 volts.

Federal Steel Company.

President C. H. Gary of the Federal Steel Co., after an inspection tour of the properties of the company issued a statement in which he said in part: "We found all the properties in good condition and the mills and transportation companies reasonably busy. The mills in the aggregate are producing about 75 per cent. of their total capacity. The ore and coal mines are working to their full capacity, the former mining and shipping a materially larger tonnage than last year at the same time. New business undoubtedly is, and for some time has been, rather dull, purchasers evincing a disposition to buy only for immediate wants. There is an inclination to wait until it is determined whether or not prices will be readjusted. So far as our companies are concerned, more is being sold now than during last month, and there is a considerable demand for export. We still have a large tonnage of unmanufactured products booked at fair prices, and the contracts are firm and unconditional."

Pneumatic Tool Litigation.

The Chicago Pneumatic Tool Co. say that in order to protect their rights under the Boyer patents, the Chicago Pneumatic Tool Co. filed suit in May, in the United States Court at Philadelphia, against the Philadelphia Pneumatic Tool Co. and the Keller Tool Co. of Philadelphia, and have now filed suit in the United States Court at St. Louis, Missouri, against the Standard Railway Equipment Co. and Peter H. Murphy of St. Louis for infringement of the Boyer patents.

A 3,000-Kilowatt Polyphase Generator.

One of eight machines of the polyphase type is on exhibition at the Paris Exposition, as built by the Allgemeine Elektricitäts Gesellschaft, of Berlin, for use in outlying central stations of the Berlin Electrical Works. The generators are designed to run at 83 revolutions, 6,000 alternations a minute. The rated capacity is 3,000 kilowatts and the winding of the machines, which is that known as star fashion, is calculated for a potential of 3,460 volts for each phase, equal to an intermeshed voltage of 6,000, the current strength being 290 amperes per phase. The generators will be driven by specially designed horizontal steam engines when placed in the Berlin stations, but the engines are not on exhibition at Paris. The inductor serves also the office of fly-wheel. The 72 poles of the machine are made of iron plates. The speed at periphery is very slightly less than 105 ft. per second. An interesting description of these machines and engines appears with illustrations in the *Western Electrician* of June 16.

Pneumatic Tools in England.

The International Pneumatic Tool Co., Limited, which controls the British patents for the Little Giant series of pneumatic tools (Standard Pneumatic Tool Co., of the United States) has made arrangements with Messrs. Evans, O'Donnell & Co., Limited, to lease a portion of the works of the latter company for the manufacture of a complete line of pneumatic tools. A number of automatic machines have been built by Messrs. Alfred Herbert & Co., of Coventry, for installation in these works. The same firm has also supplied the turret lathes for the new works.

The Pressed Steel Car Co.

An executive committee of three has been added and a second vice-presidency created in the staff of the Pressed Steel Car Co. E. A. Schoen, heretofore General Manager, is now Second Vice-President. W. H. Schoen, who has been Vice-President, has been made First Vice-President. The two Vice-Presidents with Frank N. Hoffstot, a director of the company, compose the Executive Committee. Mr. Hoffstot is President of the German National Bank, and Secretary of the Clinton Iron & Steel Co. H. G. Shellenberger is now General Manager.

THE SCRAP HEAP.

Notes.

On the Utah Division of the Oregon Short Line, water from the Great Salt Lake is to be sprinkled on the roadbed to see if it will kill the weeds.

The three principal railroads doing business at Charleston, S. C., have subscribed $40,000 to the fund for the proposed South Carolina Interstate and West Indian Exposition.

It is reported at Syracuse that about 48 freight crews running on the West Shore road, have been reduced in number from four men to three each, one of the three brakemen being dismissed.

The railroads using the Union Passenger Station, at St. Louis, and the tracks of the Terminal Railroad Association, are to pay trackage by the car instead of by the passenger. According to a new arrangement, to go into effect August 1st, $3 will be charged for each passenger car and $1.50 for each baggage car. No charge will be made on express, mail, official or dining cars, nor on sleeping cars returned empty. The revenue on express and mail business will continue to go to the Terminal Association as at present. The Merchants' Bridge will adopt a similar plan.

Mr. Luis Jackson, Industrial Commissioner of the Chicago, Milwaukee & St. Paul, states that inquiries from people desiring to settle or to establish manufacturing industries on the lines of his road are more numerous than ever before. Besides this there are now a number of towns on his line where the residents themselves are establishing factories with local capital. He has lately had inquiries from glassmakers, shoemakers, pottery manufacturers and many others. It is now too late to establish cooperage factories on the line of his road as timber is too valuable for lumber to be used for hoop-poles. Mr. Jackson expects some paper makers from England to visit Wisconsin soon.

Traffic Notes.

The Central Passenger Association gives notice that half rates for clergymen will hereafter be granted only to those residing within the territory of the Association.

The Merchants' Association of New York City has secured reduced rates for buyers to come to New York, on certain days during the coming season, from practically all of the territory east of the Mississippi and north of the Ohio rivers, except New England.

In the Corsicana (Tex.) oil field there are now more than 500 wells which are constantly worked, and new wells are opened almost daily. Oil in paying quantities has been found in Angelina County, Southeastern Texas. It is said that a refinery is to be put up at Corsicana.

The Supreme Court of Minnesota has sustained the right of the State Railroad Commission to prescribe joint freight rates over two or more connecting railroads. This decision was in a suit concerning rates on coal from Duluth to points on the Minneapolis & St. Louis, south of St. Paul.

Both the Burlington and the Chicago & Northwestern roads have obtained temporary injunctions from the United States courts restraining the State officials of Nebraska from enforcing the rate-reducing orders which they have issued against the railroad. The Burlington avers that there is no such thing as a legal State Board of Transportation in Nebraska.

The railroads of Massachusetts are now required to carry bicycles in baggage cars free. This is in accordance with a recent law, which was mentioned in these columns a few weeks ago. One road, the Fitchburg, announces that passengers going through on its line to Albany and the West may have their wheels carried free through to the point where they leave the Fitchburg road.

The Superior Court at Raleigh has approved Circular No. 1 of the North Carolina Corporation Commission prescribing rates for the transportation of fertilizer on the Seaboard Air Line and other roads. The order was issued in April, 1899, but, it appears, was not obeyed, and the Corporation Commission applied to the Court in October. The Court also decides that the railroads must pay to the State the difference between the amounts they have collected on fertilizer during the past year and the amounts which would have been charged at the reduced rates ordered by the Commission.

The Interstate Commerce Commission has asked the United States Circuit Court at Atlanta to enforce the Commission's order of Jan. 8 against the Louisville & Nashville, the Florida Central & Peninsular and the Savannah, Florida & Western concerning rates on turpentine and rosin to Savannah. A similar application has been made at Chicago for the enforcement of the order of the Commission against the Chicago & Northwestern and the Pennsylvania concerning rates from Summerdale, Ill., to Lima, O., on asbestos. This order was issued about four years ago. In Chicago, June 14, the stock yards case, involving the legality of the charge of $2 a car on cattle delivered at the Union Stock Yards, was argued before the United States Circuit Court of Appeals, to which court the case had been appealed by the Interstate Commerce Commission.

Association of Steel Makers.

The following list of the members of the Association of American Steel Manufacturers may be found interesting and useful for reference. It is official.

American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Casting Co., Chester, Pa.
American Steel Hoop Co., Pittsburgh, Pa.
American Steel & Wire Co., Cleveland, O.
Bethlehem Steel Co., So. Bethlehem, Pa.
Birmingham Rolling Mill Co., Birmingham, Ala.
Cambria Steel Co., Johnstown, Pa.
Carbon Steel Co., Pittsburgh, Pa.
The Carnegie Steel Co., Ltd., Pittsburgh, Pa.
Central Iron & Steel Co., Harrisburg, Pa.
The Colorado Fuel & Iron Co., Pueblo, Col.
Empire Steel & Iron Co., New York City.
Glasgow Iron Co., Pottstown, Pa.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlins, Ltd., Pittsburgh, Pa.
The Lorain Steel Co., Lorain, O.
Lukens Iron & Steel Co., Coatesville, Pa.
Maryland Steel Co., Sparrows Point, Md.
National Steel Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.
The Otis Steel Co., Ltd., Cleveland, O.
Park Steel Co., Pittsburgh, Pa.
The Passaic Rolling Mill Co., Paterson, N. J.
The Pennsylvania Steel Co., Steelton, Pa.
Reading Iron Co., Reading, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Shelby Steel Tube Co., Cleveland, O.
Shoenberger Steel Co., Pittsburgh, Pa.
The Standard Steel Works, Burnham, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Tidewater Steel Co., Philadelphia, Pa.
Worth Bros. Co., Coatesville, Pa.

The Patent Shaft and Axletree Company, Limited, Wednesbury.

The Directors submit a statement of accounts for the year ended March 31, which shows a net profit on trading, after providing for all bad and doubtful debts, and writing off adequate depreciations on working plant and stocks, of £51,701. Adding to this amount the balance of £4,205 brought forward from last year, there remains a sum of £55,907, from which they propose to pay a dividend of 5 per cent. per annum on the preference shares, and to pay a dividend of 10 per cent. per annum on the ordinary shares.

Opening of the Djenieu-Bou-Reszg Railroad, Algeria.

A recent issue of *L'Afrique Francaise* announces the opening of the Ain Sefra-Djenieu-Bou-Reszg Railroad, which took place on Feb. 1. If the occupation of In-Salah, the half-way point to the Niger, and the base of French exploration of the Sahara, leads to the discovery in the southern half of the desert of a line of oases continuing to the south, the question of a connection between Algeria and the Soudan will be easy to solve. Djenieu is but a temporary stopping place. The contractors have already marked out the extension of the line. Farther on the railroad will enter the wide, level valley of Zousfana, in which preliminary surveys have already been made. The cost of construction has been $11,176 per kilometer (.621 mile) of way, with a 4.9-ft. gage, without rolling stock. The whole line has cost $946,660. The cost of similar lines of the Compagnie Franco-Algerian has varied from $16,861 to $30,448 per kilometer.

Railroads in Venezuela.

The Great Venezuela Railway Co., whose headquarters are at Hamburg, Germany, has just published its annual report for 1899. At the beginning of that year affairs were satisfactory, but soon commerce was almost entirely stopped by a new revolution. Not only was passenger and freight traffic considerably hampered and at some times entirely interrupted, but also great damage was done to the railroad itself, of which track, bridges, etc., were destroyed. For the transportation of large bodies of troops the company has not yet been paid. The claims of the company for damage done to the road, bridges and telegraphs amount to 710,275 Bolivars (say $142,000).

Some Old Locomotives.

In 1846 Sharp Brothers, of Manchester, England, built eight passenger locomotives, which, in 1847, began running between Frankfort and Heidelberg on the Main & Neckar Railroad. Six of these locomotives, after 53 years' work, are still in service, though, of course, they have been, in large part, rebuilt.

Milling Lumber in Transit.

The Hungarian saw mills have had a "milling-in-transit" tariff, much like that which flour mills in many places enjoy here. That is, they have logs brought to them, and the product from them carried at a rate equivalent to that for a shipment from the place where the logs are taken to that to which the lumber is consigned, instead of the two local rates.

New Railroads in Finland.

In all parts of the Russian Empire railroad building is going on at a feverish speed. In Finland an extensive plan of future railroad building was adopted in 1898, which embraces new lines of 1,400 kilometers (870 miles) in all, corresponding to about half of the present network, and calculated to be accomplished in 15 years. The traffic, both passenger and freight, has largely increased of late, which has stimulated the demand for railroads. According to latest information received the following amounts for new railroad construction have just been allotted, viz.: 8,900,000 Finnish marks ($1,780,000) for a line from Yalnugfors to Karis; 4,080,000

Finnish marks ($816,000) for a line from Knogrio to Isalmi, and 8,473,000 Finnish marks ($1,694,600) for the completion of the line Vleaborg-Tornea, on the northern shore of the Gulf of Bothnia. All the Finnish railroads belong to the State (Jarnvagsstyrelsen i Finland) and have their headquarters at Helsingfors. Mr. G. Stromberg is Chairman and General Manager; Mr. K. A. Nordman, of Helsingfors, Engineer in Chief of Rolling Stock; Mr. A. Granfelt, Engineer in Chief of Way and Works, and Mr. A. Berner, Chief Traffic Manager. The gage is 1.523 meter, or 5 ft. At the end of 1899 the rolling stock consisted of 276 engines, 691 passenger, and about 6,700 freight cars.

The Brussels-Antwerp Electric Railroad.

The Belgian Parliament has postponed the granting of means to build an electric express line between Brussels and Antwerp, and the Government has renewed experiments with electric cars on the existing line. In the last week of May a motor car, with seats for 80, and accumulator batteries charged for two hours running, is said to have made the round trip, 60 miles, in 43 minutes.

Electricity in "Kags."

The *Western Electrician* is responsible for this: "An electrical concern in a northern city recently received from a Wisconsin man a letter of which the following is a verbatim copy: 'Please informe me if you Manufactour Ele. one cicuil or more, also if you ship it out in Kags or Bottles, and state the prices allso. I would want some for a sick person.'"

Decision on Electric Drive Patents.

A decree has been entered in the cases of the Bullock Electric Manufacturing Company vs. Baltimore *Evening News*, and Bullock Electric Manufacturing Company vs. Geo. Knapp & Co., publishers of the St. Louis *Republic*, using Crocker-Wheeler System, sustaining the validity of the Teaser patents, finding an infringement by the defendants and ordering an injunction. The Teaser patents cover a system for operating large newspaper presses and other machinery by electricity, which is now installed in many of the largest daily newspaper offices in this country and England.

Pneumatic Tools.

A good many people have started out to put a girdle around the earth since Shakespeare suggested the idea. The latest enterprise of this kind appears to be that of the Chicago Pneumatic Tool Co. We are told that although the long stroke pneumatic hammers were put on the market by this company less than a year ago enough of them have already been sold to drive a line of rivets 3 in. apart 150,000 miles long, or more than six times around the world at the equator. Although these tools have not been applied to this specific work they are going around the world fast enough. A Russian naval engineer, Mr. Beljankin, recently read a paper before the St. Petersburg Society of Marine Engineers on "The Displacement of Hand Work By Mechanical Appliances in American Shipyards." Mr. Beljankin spent a year-and-a-half in shipyards in America, studying our industrial and mechanical methods. He said explicitly that pneumatic tools were necessary to prevent strikes, although he did not say that pneumatic tools alone are enough to prevent strikes, but he did point out their great economy. In Russia a riveter is paid 42½ cents a day, as compared with $2 a day and up, paid to American riveters, and yet the Americans do riveting cheaper than the Russians because of the greater output due to their free use of power tools. He said that for calking, drilling and chipping, hand work is no longer used in America. An American workman will calk 280 ft. a day, while the Russian workman will only do 20 ft. The American workman for this job will get $4.40. The same amount of work in Russia would cost $14. He drew a similar comparison as to the cost of drilling and chipping. Obviously, with such recommendations the Chicago Pneumatic Tool Co. has received some large Russian orders.

Railroad Exhibit at the World's Fair.

Writing from Paris, May 19, to the Journal of the German Railroad Union, Franz Woas says that there was, as yet, almost absolutely nothing to see in the railroad department of the Paris World's Fair, which is installed at Vincennes, some miles from the main exposition. The great number of locomotives and cars were all standing on the tracks, it was true, but they were carefully covered up to protect them from the dust and litter of the building operations, and there was no one to show them. There will be a great deal to see, but it was impossible then to say when it could be seen.

Gratuities to Russian Railroad Men.

On the Russian State Railroads about $1,000,000 yearly is appropriated for gratifications to the employees, something in the nature of Christmas gifts, intended, ostensibly, to make life a little easier for hard working and poorly paid trackmen, trainmen, etc. Somebody has been trying to find out where this money goes to, and he reports that one-fifth of it goes to the officers, for whom it amounts yearly to 120 per cent. of a month's pay; while the rest of it adds 65 per cent. of a month's pay to each employee. The officer getting $200 a month has a gratification of $240 yearly; the man working for $10 a month, gets $6.50. But these gifts are paid very irregularly, and it was not till this spring that they were paid for 1898, and partly for 1899. What wages are is indicated by the Ministry of Transportation, which reports the average yearly pay in 1897 of men in the central offices to have been $450; in local general offices, $323; construction and maintenance of road and buildings, $98; train and telegraph service, $182; locomotive and shop service, $320. With these wages a "gratification," even a little one, ought to be very welcome.

The Manhattan Railway.

We noted very briefly last week the fact that the Executive Committee of the Manhattan Railway Co. had approved certain contracts and had adopted the general plan of running six-car trains with a motor car at each end of the train for the new electrical equipment. President Gould reported at this meeting that real estate had been bought for the central power station and several sub-stations, and additional yard room for 400 cars. The purchase and contracts, to date, involved the expenditure of over $6,000,000. Over one-half of this is for machinery, etc., for the power station, which machinery will begin to arrive in September, the first being one of eight engines of 8,000 h. p. from the E. P. Allis Co. The excavation for the power house site is completed and the foundation well under way. The steel will begin to arrive by July 1 at the latest, when erection will at once begin. The extension of the company's line from 177th St. to Fordham is well advanced.

A quarterly dividend of 1 per cent. has been declared, payable July 1. The business for the year shows 9,700,000 more passengers carried than in 1899. This is partly estimated as it is up to June 30. The transfer system between the Elevated and the Third avenue lines was used during the year by 7,970,000 passengers.

Hot Boxes in India.

A recently published item states that during the quarter ending Dec. 31, 1899, there were 769 hot journals on the Northwestern Railway of India. For the month of January, 1900, it is said that 643 were recorded. Various mixtures of vegetable and mineral oils have failed to allay the trouble. Perhaps a study of bearing metals and of the proportions of bearing surface to journal load would bring a remedy, more quickly than experiments with castor oil.

Technical Schools.

Rensselaer Polytechnic Institute.—The Rensselaer Polytechnic Institute will presently have a laboratory of physical tests of material and electrical machines. The Williams Proudfit Observatory Building will be readapted to these purposes, $33,000 being now subscribed for the work of preparation. The building will be remodeled and thoroughly equipped with testing and power machinery. The proposed change has met with liberal support, gifts of machinery, money pledged, and endowments resulting from the project having within a year exceeded $58,000.

Stevens Institute.—During the commencement week the Alumni Association held its annual meeting in the Stevens Hall. In the address of the retiring President he spoke especially of the importance of giving attention to the selling end of the business of the mechanical engineer, a branch which has not received the attention that it deserves. Dr. Morton spoke of the progress of the Institute in general, and of the new Carnegie Laboratory of Engineering in particular. This latter, he said, would be followed within a year or two by another building to be built with the alumni building fund, which now amounts to over $53,000. With these two buildings the accommodations of the Institute will be increased more than 50 per cent. Mr. Henry R. Towne, of Stamford, Conn., and Mr. Alfred R. Wolff, of New York, were elected permanent members of the Board of Trustees, filling the vacancies caused by the deaths of Mrs. Stevens and Chancellor McGill. Mr. Allen S. Miller, of New York, was elected to the Board as the alumni representative for the term of three years. Dr. Morton spoke of the section of the first T rail designed by Mr. Robert L. Stevens in 1830 and rolled under his direct supervision in England. This section is to be presented to Mr. Andrew Carnegie by the Institute as some recognition of his fine gift which enabled the Institute to build the new engineering laboratory. The graduating exercises were held June 15, the address to the graduating class being delivered by Mr. Walton Clark, General Superintendent of the United Gas Improvement Co., of Philadelphia. The degree of mechanical engineer was conferred upon 53 young men.

An Auto-Horse.

A European inventor has, without apology, filed claims upon a design for an auto-mobile horse. This "horse" will naturally require an automaton for driver, in the present progression. Somebody will therefore have need to turn his attention to "James" on the box.

Grade Crossings in Illinois.

The Chicago & Alton R. R. has filed a petition with the State Railroad & Warehouse Commission asking for protection of the grade crossing of the C. & A. and Terre Haute & Indianapolis tracks at Atlanta, Logan County. The Alton also asks protection of the Vandalia tracks at Minier, Tazewell County. On June 12 the Commission heard argument on petition of the Louisville, Evansville & St. Louis R. R. for a hearing of the case of the Illinois Terminal Co. against the Air Line for a grade crossing at Winstanley Park, East St. Louis. The Commission recently ordered an interlocking system at this crossing. The Commission is also considering the petition of the Collinsville, Caseyville & East St. Louis electric railroad for a crossing of the tracks of the Vandalia near Caseyville.

The John Stephenson Car Works Sold.

The car works of the John Stephenson Co., near Elizabeth, N. J., were sold at auction June 12, under the direction of the receiver, Albert R. Wilcox. The plant comprising seven buildings and 88 acres brought $177,000. The buyers are John C. Willetts and Adolph Wimpfheimer of New York, who also bought the lumber in stock for $37,500. The plant which cost about $400,000 was begun in 1896. It was in operation a short time before the foreclosure.

More Street Railroads for Chicago.

Lowering of tunnels, extension of franchises, downtown street car terminal facilities, modification of the present system of transfers and other street railroad matters were discussed at a meeting of the Chicago Council Street Railroad Commission June 12. It is stated that it is impossible for the street railroads to increase the number of trains running into the downtown district unless every street is used between Van Buren street and the river. The street railroad companies desire more room for loops in the downtown district.

Proposed Grain Elevators for New York Harbor.

A public hearing was given by the Harbor Line Board in New York last week to Edward F. Cragin and representatives of the New Jersey Riparian Commission, regarding Mr. Cragin's proposition to make an island on the shoals between Ellis and Bedloe's islands, New York Harbor, upon which grain elevators and steamship piers may be built. Mr. Cragin also intends to deepen the channel on either side of the island. The New Jersey Riparian Commission has approved the grant.

The Engineers at Paris.

On the evening of June 15 the French Society of Civil Engineers gave the first of a series of receptions in honor of delegates from foreign societies. Among those present were representatives of many of the local engineering societies of the United States.

LOCOMOTIVE BUILDING.

The Mexican National is having 2 engines built by the Baldwin Locomotive Works.

The Pere Marquette is having 2 locomotives built by the Brooks Locomotive Works.

The Jalapa Railway & Power Co. is having 1 locomotive built by the H. K. Porter Co.

The Great Northern of Canada has ordered seven 10-wheel locomotives from F. M. Pease.

The Mexican Central, it is reported, has been authorized by its directors to buy 45 locomotives.

The Pittsburgh Plate Glass Co. is having 1 engine built by the Pittsburgh Locomotive Works.

The New York, Ontario & Western is having 3 engines built by the Cooke Locomotive & Machine Works.

The Cleveland, Cincinnati, Chicago & St. Louis, as noted last week, is in the market for locomotives. We are officially informed that six heavy 10-wheel engines will be ordered, having cylinders 20 x 28 in. and driving wheels 78 in. in diam. These engines will weigh between 165,000 and 170,000 lbs. in working order, and will have tenders with 6,000 gallon capacity tanks.

CAR BUILDING.

The American Car & Foundry Co. has received an order for 200 mine cars.

The Baltimore & Ohio, it is again rumored, is about to place an order for 5,000 freight cars.

The Delaware & Hudson has ordered 100 steel coal cars from the American Car & Foundry Co.

The Buffalo, Rochester & Pittsburgh is having 2 passenger cars built by the Jackson & Sharpe Co.

The Burlington, Cedar Rapids & Northern is having 4 passenger cars built by the Barney & Smith Car Co.

The Rio Grande Western has ordered from the Pressed Steel Car Co. 50 steel coal cars of 100,000 lbs. capacity.

The Pittsburg, Shawmut & Northern is asking bids on 500 hopper-bottom coal cars of 80,000 pounds capacity.

The Shreveport & Red River has placed an order with the American Car & Foundry Co. for 35 box and 65 flat cars.

The El Paso & Northeastern has ordered 175 large capacity steel coal cars from the American Car & Foundry Co.

The Allison Mfg. Co., it is reported, has received an order for 150 freight cars to be shipped to the Argentine Republic.

The Mexican Central, it is reported, has been authorized by its directors to buy 350 box, 50 coal, 50 flat and 8 passenger cars.

The American Refrigerator Transit Co., we are officially informed, is not having 400 refrigerator cars built by the American Car & Foundry Co., as noted in a recent issue.

The Great Northern of Canada has ordered from F. M. Pease six passenger coaches, one combination car, one private car, 100 box cars and 50 gondola cars. This is in addition to orders previously noted.

BRIDGE BUILDING.

ALLEGHENY, PA.—The Finance Committee has approved an ordinance appropriating $65,000 for a bridge at Shady avenue, according to report.

ATCHISON, KAN.—Reports state that plans and specifications have been made and bids asked for rebuilding the superstructure of the Atchison & Easton Bridge Company's bridge over the Missouri River at Atchison. H. P. Eels, of Cleveland, O., is President.

AUBURN, N. Y.—At the meeting of the Common Council, June 11, all bids for the Lazette street bridge were rejected, and a new design submitted by the Groton Bridge & Mfg. Co., for a single span 220½ ft. long, was accepted and a contract ordered, at the price of $12,900. This action still awaits the approval of the Mayor. D. F. Austin, City Surveyor, June 4, p. 362.

BATTLE CREEK, MICH.—Reports state that plans are being made by the City Engineer for a bridge on Monroe street.

BEDFORD, MASS.—The Lexington & Boston Street Ry. Co. will build a bridge over the Boston & Maine R. R. tracks at Bedford.

BIDDEFORD, ME.—We are informed that bids will be wanted about Aug. 1 for an iron deck girder bridge over the Saco River at Main street, Biddeford, to Saco, which will be about 225 ft. long and cost between $15,000 and $20,000. M. B. Walker, Mayor.

BILOXI, MISS.—The bids received for the combination bridge over Back Bay have been returned unopened. Other bids will be wanted at a future date.

BUFFALO, N. Y.—Citizens of South Buffalo are trying to get an additional appropriation for the new bridge over Buffalo Creek at the junction of Seneca and Elk streets. The Council has appropriated $26,000 for this bridge, but about $12,000 more is needed, which will probably be transferred from the appropriation for dredging the Buffalo River.

Bids for the new viaduct over the Western New York & Pennsylvania tracks on Babcock street, opened June 16, were reported as follows:

Substructure—Miller & Franklin, $79,454.85; William H. Schmidt, $82,458.35; Harrer Construction Co., $62,527.25; Dwyer & Huntington, $73,076.09; Mensch, McKowan & Mensch, $69,787.15; Moshier & Summers, $67,304.75; Rumrill & Cotter, $72,221.00; Williams, McNaughton & Bapst, $74,685.37; A. P. Kehr, $82,426.55.

Superstructure—Pennsylvania Steel Co., $62,413; Toledo Bridge Co., $59,360; Penn. Bridge Co., $64,125; King Bridge Co., $69,234; Boston Bridge Works, $67,455; Buffalo Bridge & Iron Works, $57,550; Elmira Bridge Co., $58,489.

CAMDEN, N. J.—Bids are wanted, June 27, for a steel bridge over Cooper's Creek. J. J. Albertson, County Engineer.

CHICAGO, ILL.—We are informed by the Chicago, Rock Island & Pacific that the Lassig Bridge & Iron Co. will build the superstructures for all its bridges in 1900, and that the railroad company will do all the foundation work.

Plans were submitted to the Mayor last week by John M. Smyth for a viaduct at Kinzie street from Franklin or Market street across the railroad tracks and the river to Union street.

The contract for a bascule bridge over the Calumet River at Ninety-fifth street, South Chicago, is let to Roemheld & Gallery, at $151,808. The bridge will be 150 ft. long and two equal spans, and the roadway will be 60 ft. wide.

CLEVELAND, O.—The Wrought Iron Bridge Co., according to report, has the contract for the superstructure of the Willet street bridge.

Clifton Forge Va.—Two bridges about 400 and 500 ft. long and about 40 ft. wide are proposed at this place. J. W. C. Bryant, member of the Bridge Committee.

Coatesville, Pa.—Local reports state that the Pennsylvania R. R. will abolish two grade crossings, according to an ordinance recently passed by the Council.

Connersville, Ind.—The County Commissioners will receive bids at 2 p. m., June 23, for an iron bridge 65 ft. long over Simpson's Creek. H. M. Broaddus, County Auditor.

Costonia, O.—The bridge over Island Creek, for which bids are wanted July 2, is at Costonia, Jefferson County, not Castoria, as incorrectly stated last week (p. 406). Frank Stokes, County Clerk, Steubenville.

Cumberland, Md.—The Piedmont & Cumberland Ry. has let a contract to the Pittsburgh Bridge Co. for the 160-ft. steel bridge near Market street.

Davisville, Cal.—A contract for the bridge over Putah Creek for Yolo and Solano counties is let to the San Francisco Bridge Co. (May 25, p. 346.)

Fairmount, W. Va.—Bids are being received by Chas. Worthington, 413 Fourth avenue, Pittsburgh, Pa., for a steel bridge about 500 ft. long over Tygart Valley River, near King Station, on the Baltimore & Ohio R. R., for the Virginia & Pittsburgh Coal & Coke Co. The estimated cost is $25,000.
See also Valley Bend, W. Va.

Fall River, Mass.—The Railroad Commissioners will give a hearing on the petition to make alterations to the bridge between Fall River and Somerset.

Flemington, N. J.—The Board of Freeholders of Hunterdon County has ordered a new iron bridge at Cokesbury. A new bridge is also ordered at Van Syckle's Corner Union Township, and a new bridge at Pittstown.

Gardiner, Me.—Reports state that a bridge is proposed over the Causeway near the Coliseum.

Geneva, Ind.—The Grand Rapids & Indiana Ry. will build a bridge over the Big Lumberlost at Geneva, we are informed.

Hawkesbury, Cape Breton, N. S.—We are informed that two companies are figuring on the plans for the bridge proposed over the River Inhabitant about eight miles east of Port Hawkesbury, for the Canso & Louisburg Ry. Co. It will be an iron or steel structure on stone piers, being 400 ft. long and having 400 ft. of approaches. The estimated cost is $76,100. Colonel Henry Alton, 31 Broad street, New York, is Vice-President and General Manager. (Cape Breton, June 15, p. 406.)

Hoquiam, Wash.—Bids are asked by the city on $15,000 bonds for building the drawbridge over Hoquaim River.

Huntington, Pa.—A joint committee of viewers from Blair and Huntington counties are considering a site for a bridge on the county line over the Juniata River, near Shoenberger Station on the Pennsylvania R. R.

Jersey City, N. J.—The Hudson and Bergen County Boards of Freeholders have voted to build a new bridge over the Hackensack River at Seacaucus, on the Paterson Plank Road, at a cost not to exceed $250,000.
Joseph Cutley has the contract for the bridge over the Pennsylvania R. R. cut at Baldwin avenue, at $23,423. (June 1, p. 363.)

Johnstown, Pa.—Local reports state that conferences have been held between city officers and officers of the Pennsylvania R. R., regarding elimination of the grade crossing in Johnstown.

Keene, N. H.—The contract for the two steel bridges over Ashuelot River is let to the Wrought Iron Bridge Co. (May 25, p. 346.)

Louisville, Ky.—The Louisville & Nashville will need three large trestles on a 5-mile branch for which contracts are about to be let; also a number of bridges and trestles on another branch 30 or 40 miles long.

London, Ont.—The Grand Trunk Ry., according to report, will build a bridge at the Cove.

Marathon, N. Y.—A new bridge will be built over the Tioughnioga River, replacing the present 175-ft. wooden bridge. Chas. F. Stowell, Designing Engineer, Albany.

Miami, Fla.—Plans made by the King Bridge Co. have been accepted for a new bridge over Miami River at Avenue D, which will be 375 ft. long and 90 ft. wide.

Mound City, Kan.—Bids are wanted, July 6, by J. A. Cody, at Mound City, for two steel bridges—one over Elk Creek and the other over Turkey Creek, both in Linn County.

New York, N. Y.—The annual report of Bridge Commissioner John L. Shea, to Dec. 31, 1899, was published last week. Repairs are suggested to a number of bridges and new bridges recommended in place of present dilapidated structures, but no immediate work is in prospect.

Natchitoches, La.—The date for receiving bids for the railroad and traffic bridge over the Red River at Grand Ecore, several miles above this place, by the Natchitoches Railway & Construction Co., is changed from June 11 to Aug. 6. D. C. Scarborough, President. (May 11, p. 310.)

North Bellingham, Mass.—A bridge will probably be built over the Midland Division of the Consolidated Road at North Bellingham for the Middleboro, Attleboro & Woonsocket St. Ry. Co. Geo. W. Wiggin is President of the Street Railroad.

Norton, Kan.—Bids are wanted, July 6, by J. W. Woodward for a steel bridge over Solomon River at Edmond, Kan.

Omaha, Neb.—The Dakota, Nebraska & Southern R. R. will need four large bridges—across Loup, Niobrara, White and Missouri Rivers. See "Railroad Construction."

Oskaloosa, Ia.—The Board of Supervisors, according to report, will want bids in September for a 90-ft. bridge over Skunk River.

Ottawa, Ont.—J. R. Roy, Secretary of the Dominion Public Works Department, wants bids for the superstructure of the Maria street bridge. The contracts for the masonry work have been let.

Payson, Utah.—The Rio Grande Western expects soon to put a new iron bridge over the Oregon Short Line Ry., to replace the wooden structure now in use.

Peoria, Ill.—Bids will probably be wanted in about two weeks for six bridges for Peoria County. Three bridges are to cross the north branch of Kickapoo River, two the McQuown River, and another at La Marsh River. Address Geo. C. Murray, 1301 North Monroe street, Chairman of the Committee on Roads and Bridges, County Board of Supervisors. The kind of bridges will probably be decided within another week. Appropriations to meet half the cost for each of the bridges have been made.

Philadelphia, Pa.—The Common Council has passed a bill appropriating from the loan of June 17, 1898, $600,000 for new bridges; also money for repairing bridges.
The sub-committee on bridges has been considering sites for two proposed bridges along the Philadelphia & Reading Ry., at Olney Lane and Oak Lane. These bridges are included in the list now under consideration by the sub-committee, to be paid for out of the $600,000 set aside for bridges.

Phoenix, Ga.—A new bridge is contemplated over the Chattahoochee River near North Phoenix.

Pittsburgh, Pa.—E. M. Bigelow, Director of Public Works, wants bids until noon of June 22 for a bridge across Junction Hollow from Wilmot street to Schenley Park. It will be a steel bridge about 40 ft. wide and cost in the neighborhood of $150,000.
It is understood that the Pittsburgh & Lake Erie and Pittsburgh & Western Railroads will have to build bridges over the Shenango River.

Plainfield, N. J.—The Boards of Freeholders of Somerset and Union Counties will build a joint bridge over Green Brook, connecting Madison avenue with Duer street. Bids are wanted.

Regina, N. W. T.—The Deputy Commissioner of Public Works at Regina wants bids until June 30 for a number of bridges. The largest is to cross the Point Aux Pins Creek. Plans and specifications can be had from T. G. Pearce, Agricola, Alberta.

Rochester, N. Y.—The Railroad Commission of the Common Council is considering a new grade crossing at Maple street. The railroad company proposes to build a subway.

Rockland, Me.—A steel bridge, according to report, is recommended by the City Engineer at Naverich street.

Rutland, Vt.—The Rutland R. R. has let contracts to the Rochester Bridge & Iron Works for two bridges on the main line, one 199 ft., of two spans, one a through lattice and the other a through girder, at $14,800. The other bridge is 196 ft. long, of two plate girders, costing $15,400. Another steel bridge 150 ft. long of two through plate girders, on the B. & R. Division, is also let to this company. (See Burlington, Vt., June 8, p. 378.)

Slatington, Pa.—A new bridge will be built on Main street across Trout Creek and a branch of the Lehigh Valley R. R., by the Commissioners of Lehigh County. The bridge will be about 220 ft. long and 42 ft. wide, but it is not decided whether it shall be a steel or stone arch. G. T. Oplinger, Borough Engineer.

St. Albans, Vt.—The three-span wooden bridge over the Missisquoi River at Sheldon Junction, used by the Central Vermont, was burned June 14. It was 359 ft. long.

St. Louis, Mo.—Plans for a new bridge over the St. Louis & San Francisco tracks at Chouteau avenue were approved and recommended to the Municipal Assembly for an ordinance June 14. The bridge will probably cost $25,000.

Stockton, Cal.—A bridge is proposed over the Stanislaus River. The matter is before the San Joaquin Board of Supervisors.

Thermopolis, Wyo.—The Pueblo Bridge Co., Pueblo, Col., has the contract for the 250-ft. steel bridge over the Big Horn River. (May 18, p. 328.)

Toronto, Ont.—We are informed that probably nothing will be done toward building a bridge at the head of Parliament street in Toronto for some time. (June 8, p. 378.)

Utica, N. Y.—The City Engineer, according to report, will soon receive bids for the new bridge at Park avenue.

Valley Bend, W. Va.—Bids are wanted, June 25, by Lee Crouch, County Clerk, Elkins, W. Va., for a 229-ft. steel bridge over Tygart Valley River.
See also Fairmont, W. Va.

Watertown, N. Y.—A viaduct is recommended at Arsenal street, at a probable cost of $28,000. A. N. Sutermeister, Engineer to the State Railroad Commission.

Waynesboro, Miss.—The King Bridge Co. has contracted with the Wayne County Board of Supervisors for three steel bridges—one at $6,952, another $8,900, and a third at $4,250. The Board of Supervisors will issue bonds for $20,000.

Westport, Conn.—We are informed that the State street bridge will not be rebuilt at present, but repaired. J. G. Hyall, Town Clerk. (May 25, p. 346.)

Wilkesbarre, Pa.—Bids will be received at the office of H. H. Wellis, Secretary Pond Hole Bridge Construction Co., 33 Coal Exchange Bldg., Wilkesbarre, until 12 o'clock, noon, June 23, for building a concrete and iron bridge and filling the approaches over the Wilkesbarre pond hole on line of Market street, between Wilkesbarre and Kingston, according to plans and specifications on file at office of H. S. Smith, Engineer, 79 Coal Exchange.

Winnipeg, Man.—Government assistance is asked toward building a bridge over Swan River at the town of that name.

Other Structures.

Anderson, Ind.—There is no truth in the report that the Cleveland, Cincinnati, Chicago & St. Louis will build large shops at Anderson. The company contemplates building a ten-stall engine house with a small annex at that point.

Hoboken, N. J.—Work has been begun on the Carnegie Laboratory on the campus, for Stevens Institute of Technology in Hoboken. Mr. Andrew Carnegie gave $65,000 to the building fund.

Island Pond, Vt.—Relative to the reports that the Grand Trunk proposes removing the shops from Richmond, Que., and Gorham, N. H., to Island Pond, Vt., we are informed that nothing is being done in this direction at present.

Jersey City, N. J.—The Structural Engineering Co. is preparing plans and specifications for a factory building and power house for the Central Lard Co. to be built at the corner of Seventeenth and Coles streets, Jersey City.

Monessen, Pa.—The Page Woven Wire Fence Co., of Adrian, Mich., will build a plant in Monessen, consisting of a steel mill, furnaces, bloom, rod and wire mills to make wire to be used in Page fences. The plant is also equipped with nail machinery and looms. The steel mill is 650 x 100 ft., with an addition of 400 x 30 ft. The wire mill is 530 x 50 ft. A building 440 x 50 ft. contains the looms and nail machinery. The machine shop is 350 x 30 ft. Twenty engines of various sizes are used, with a total capacity of 6,000 h. p.

Parsons, Kan.—We are informed that the Missouri, Kansas & Texas is making extensions to the present shop buildings at Parsons. Reports state that there will be four buildings—car repair shop, 48 x 132 ft.; blacksmith shop, 150 x 70 ft.; tank and steel shop, 125 x 60 ft., and boiler shop, 150 x 80 ft. The whole work is expected to cost $90,000.

Philadelphia, Pa.—Reports state that the Pennsylvania has accepted plans for a new station at Germantown Junction, and that a contract has been let to Geo. W. Roydhouse & Co., of Philadelphia. The station building will be 115 ft. long and 35 ft. wide.

Pittsburgh, Pa.—W. H. Brown, Chief Engineer of the Pennsylvania, is asking bids until 10 o'clock, a. m., June 27, for the new passenger station at Pittsburgh, the plans of which are at the office of the architects, Messrs. D. H. Burnham & Co., Chicago, Ill. A view of this station, with a description, was given in the *Railroad Gazette*, March 11, p. 301.

Tampico, Mex.—The Missouri Valley Bridge Co. has a contract for building a steel wharf for the Mexican Central R. R. at Tampico, which will cost about $1,000,000. The wharf will be 29 x 800 ft., partly covered with an iron shed. Upwards of 2,000,000 pounds of steel material is contracted for.

Vancouver, B. C.—A large shed will be built over the Canadian Pacific tracks at Vancouver.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xiii.)

Southern Railway Agents' Association.

The local freight and passenger agents at the numerous large stations on the extensive lines of the Southern Railway have an association, for discussing subjects concerning their work, and the annual meeting of this body will be held in Washington, D. C., July 10 and 11. Among the subjects announced for discussion at this meeting are the following. "Is It Not Practicable to Discontinue Sending So Much Freight on Card Way Bills in Advance of Regular Way Bills?" "Is It Not Possible to Have Better Loading by Compressors, Oil Mills and Other Exporters With a View to Avoiding Splitting Up of Lots?" "Fire Insurance; How to Ascertain the Maximum Quantity of Freight in a Warehouse at Any Hour During the Twenty-Four"; "Simplification of Rates and Divisions for Easy Application by the Local Agent"; "Is It Practicable and Desirable to Stencil Name of Station and Date on Packages Forwarded?" "Promptness, Accuracy and Courtesy in Passenger Matters"; "Catchy Advertising."
The President of the Association is Mr. E. H. Lea, of Richmond, and the Secretary is F. N. Tate, of Charlotte N. C.

Society for the Promotion of Engineering Education.

The eighth annual meeting of the Society for the Promotion of Engineering Education will be held at Columbia University, New York City, July 2, 3 and 4. This will follow immediately after the sessions of the American Association for the Advancement of Science, which will be held during the last week in June. Fifteen other affiliated societies will meet during that week.
The President of the Society for the Promotion of Engineering Education, Prof. Ira O. Baker, has already sailed for Europe, and Prof. Robert Fletcher, of Hanover, N. H., the Vice-President, will preside. Mr. Baker's presidential address is on "Engineering Education in the United States at the End of the Century." Probably the most important committee report will be that on "Industrial Education," by Prof. J. B. Johnson, Dean of the College of Mechanics and Engineering, University of Wisconsin. Quite closely related to this will be a paper on "The Relations of the Technical School to the Manufacturer," by Mr. W. B. Snow, of Jamaica Plain, Mass. The entire session of Monday afternoon, July 2, will be devoted to the presentation and discussion of Prof. Johnson's report. Aside from the address the report and the paper already mentioned there are 15 papers and reports, each on some phase of engineering education.

The Engineers' Club of Philadelphia.

The next meeting of the club will be held Sept. 15.

MEETINGS OF CHEMISTS.

Some of the chemists of the club have agreed to meet at the club house on the evening of the fourth Saturday of each month, from September to May, both inclusive, to discuss in an entirely informal manner questions of engineering chemistry. It is not proposed to have formal papers or to organize a section, though it may be worth while to give a name to the meeting, and several such have been proposed. Such meetings will be open to all members of the club. Further notice will be given in the Fall.

PUMPING-ENGINES OF THE PHILADELPHIA WATER-WORKS.

At the stated meeting held June 2 Mr. Henry G. Morris read a paper upon the above subject, illustrated by a large collection of lantern slides. After a resume containing the dates of installation of various parts of the city water-supply, he gave a brief description of the different styles or types of pumping-engines which have been installed in recent years.
In the discussion which followed, Professor Luigi d'Auria described the hydraulic compensator and other details of the pumping-engine which bears his name.

PERSONAL.

(For Other personal mention see Elections and Appointments.)

—Mr. Eugene Klapp has been appointed by the New York Rapid Transit Commission Division Engineer, with a salary of $4,000 a year. He will have charge of the construction of viaducts.

—Mr. Edward M. Bigelow, for a number of years

Director of the Department of Public Works of Pittsburgh, Pa., has recently resigned and will open an office in Pittsburgh as a civil engineer.

—Mr. Geo. A. Keefer, of Victoria, B. C., has been appointed Resident Engineer of the Dominion Government Public Works Department in British Columbia, in place of Mr. J. R. Roy, recently appointed Secretary of the Department. Mr. Keefer was in 1884 Inspector of Bridges for the Canadian Pacific R. R.

—Mr. W. F. Holwill, until recently General Passenger Agent of the Delaware, Lackawanna & Western, is now Chairman of the General Eastern Passenger Agents' Committee of the Trunk Line Association, with headquarters at 396 Broadway, New York City. Heretofore this Committee has chosen a Chairman from among its own members.

—Mr. J. Elfreth Watkins, Asso. M., Am. Soc. C. E., Curator of Mechanical Technology, National Museum, received the degree of Doctor of Engineering from Stevens Institute at the commencement season this year. This is given "in recognition of his many and admirable contributions to the history of engineering, especially in relation to transportation."

—Mr. Charles W. Gibson, whose resignation as Assistant General Traffic Manager of the Mobile & Ohio we noted last week (p. 407) was born in Mississippi, August 31, 1855. He entered the service of this company in 1874 as Operator and Assistant Agent at West Point, Miss. Mr. Gibson's resignation does not become effective until Sept. 1, at which time he will retire from railroad service to enter commercial life.

—Mr. Samuel Greer, Roadmaster of the Northampton Division of the New York, New Haven & Hartford, died at his home in Westfield, Mass., June 13, after an illness of several months. Mr. Greer was 59 years old. He was born in Ormstown, P. Q., but had lived in New England most of his life. He had been Roadmaster of the Bennington & Rutland and the Hartford & Connecticut Western before going to the New Haven Road. He had been on the latter road for 14 years and in 1897 was President of the New England Roadmasters' Association. Mr. Greer was a veteran of the Civil War and was twice a member of the Connecticut Legislature.

—Mr. Ben. Johnson, the new Engineer of Tests of the Atchison, Topeka & Santa Fe at Topeka, Kan., was born at Ithaca, N. Y., Oct. 15, 1858. Mr. Johnson was graduated from Cornell University in 1878, and was engaged in mining in Colorado until June of the following year, when he entered the service of the Atchison as machinist at Topeka. He remained in the Locomotive Department of the Atchison until 1888, when he was Roundhouse Foreman at Argentine. He then entered the service of the Westinghouse Air Brake Co. as inspector, and continued with that company until December, 1898, when he returned to the Atchison as Division Master Mechanic at Topeka.

—Mr. Harry Pollitt, Locomotive Engineer of the Great Central Railway, has resigned his position. The Great Central, as probably the reader remembers, is the name recently taken by the Manchester, Sheffield & Lincolnshire Railway, with which Mr. Pollitt has been connected for a number of years on the engineering staff. This railroad has recently extended its line into London, where great terminals have been built, and the new name was taken at the time of this partial reorganization. Mr. Pollitt spent some weeks in the United States last autumn principally for the purpose of attending to orders for locomotives. We have not yet learned the reason for his resignation or his plans for the immediate future.

—Mr. Percy Gifkins, whose advancement to the position of General Manager of the Dominion Atlantic at Kentville, N. S., has been noted, was born at Harpenden, Eng., Dec. 25, 1850. He entered railroad service in 1871 with the Windsor & Annapolis, now the Dominion Atlantic. He served as Auditor and Paymaster until 1872 and for the three years following was Stationmaster at Annapolis and Halifax. From 1875 to 1889 he was Auditor of the Dominion Atlantic, and until 1893 Auditor and General Passenger Agent. Then until 1896 he was General Passenger Agent, and from January to August, 1897, Traffic Superintendent, and until his recent advancement, General Superintendent. Since the death of the General Manager he has performed practically the same duties that devolve upon him under his new appointment.

—The retirement of Frank S. Bond as Vice-President of the Chicago, Milwaukee & St. Paul was recently noted in these columns. Mr. Bond is a native of Massachusetts. He entered railroad service in 1849 in the office of the Treasurer of the Norwich & Worcester. From 1851 to 1856 he was Secretary of the Cincinnati, Hamilton & Dayton. Then for five years he was Secretary and Treasurer of the Auburn & Allentown and the Schuylkill & Susquehanna roads. In 1868 he was appointed Vice-President of the Missouri, Kansas & Texas, and five years later Vice-President of the Texas & Pacific. In 1881 and 1882 he was President of the Philadelphia & Reading. For two years from 1884 he was President of the associated railroads which make up the Queen & Crescent Route. He then accepted the Vice-Presidency of the Chicago, Milwaukee & St. Paul.

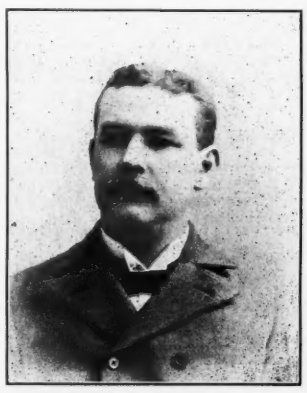
—Mr. E. H. Talbot, the founder and for many years proprietor of the *Railway Age*, is going to take up his residence in the City of Mexico, where, in connection with a prominent Mexican lawyer and congressman, Mr. Augustin Arroyo de Anda, he will establish an agency for American investors and manufacturers, and general bureau of information in the interest of American railroads and hotels, and other interests directly related to travel. Mr. Talbot, some years ago, conducted a party of some thirty leading Mexican editors and public men on a tour of the principal cities of the United States. In return for this service the Mexican Press Association later made Mr. Talbot its guest for a month's tour of that country, so that he has had unusual opportunities for familiarizing himself with Mexico and its condition. He also has influential friends in the various States of the Republic.

—Mr. Henry K. Nichols, Chief Engineer of the Philadelphia & Reading, has been granted leave of absence for three months and Mr. William Hunter, heretofore Assistant is Acting Chief Engineer. Mr. Nichols is now 70 years old and it is said he will probably be retired from active service and will be made Consulting Engineer. Mr. Nichols was born in Pottsville, Pa., and began his career as a Railroad Engineer on the survey for an extension of the Mill Creek Railroad in 1847. He remained with that road three years as Assistant Engineer and then for seven years served on various roads and canals. In 1857 he was employed by the Government as Principal Assistant Engineer in the west and took part in the preliminary surveys for the Pacific railroads. He returned east in 1858 and was Engineer for a number of small roads in Pennsylvania; and began his service for the Reading when these lines were leased by that company. He was appointed roadmaster in 1883, and in 1885 succeeded Mr. William Lorenz as Chief Engineer.

—Mr. Lewis L. Seymour, an American engineer, was killed recently while serving with the Railway Pioneer Regiment, which is helping to repair the railroad and maintain the line of communication between Cape Town and Pretoria. He was killed in the action at the Zand River, between Rhenoster and Bloemfontein. He had the rank of Major in this regiment, which was commanded by Col. Girouard, Royal Engineers. Col Girouard is the officer who distinguished himself in building the military railroad in the Soudan which enabled Lord Kitchener to bring his campaign there to a prompt and successful conclusion. Major Seymour has been doing work of great value along the line of communication in repairing the railroad and building temporary bridges. He was born at Whitney's Point, Broome County, N. Y., in 1860. He had worked with the Lackawanna Steel & Iron Co., at Scranton, and with the Dickson Manufacturing Co., at the same place. For the latter company he went to Venezuela in charge of mining machinery, where he stayed for three years. In 1888 he went to Kimberley in the employ of the De Beers Mining Co., and later became a mining superintendent on the Rand.

—Mr. H. Walter Webb died at his home on the Hudson on Monday of this week. Although Mr. Webb had been suffering for some years from tuberculosis his death now was not expected, and indeed it was believed that his health was improving. It will be well remembered that Mr. Webb retired from the office of Third Vice-President of the New York Central & Hudson River Railroad March 26, 1898, because of ill health. That office was created for him in 1890, and it carried with it the duties usually performed by the General Manager of a great system, and Mr. Webb was the actual operating head of the road. In this position he displayed ability, energy and resolution which would have carried him far, in spite of the fact that he had practically no railroad training at the time he took the office other than such training as he had received in about four years' service as Vice-President of the Wagner Palace Car Co. Mr. Webb was born at Tarrytown, N. Y., May 6, 1852, and was a son of James Watson Webb, distinguished as a journalist and brother of Gen. Alexander S. Webb, a gallant soldier of the Civil War. H. Walter Webb was graduated from the School of Mines of Columbia College in 1873, being first in his class. Then he graduated from the Columbia Law School, and was admitted to the bar in 1875. He practiced law for seven years, and then went into business as a banker and broker in Wall street, where he remained until he took service with the Wagner Company.

—Notice has already been made in these columns of the appointment of Chas. H. Schlacks, as General Manager of the Colorado Midland. Mr. Schlacks was born at Chicago, Ill., Nov. 12, 1865. He entered railroad service in 1879 as office boy with the Illinois Central, and continued with that company until 1891, serving successively as machinist's apprentice, machinist, mechanical draughtsman, chief clerk to the Superintendent of Machinery, and chief clerk to the General Superintendent. In 1891, after spending a few months with the Grant Locomotive Works, he went to the Denver & Rio Grande, on Nov. 1, as Secretary to the General Manager. Three years later he was appointed Assistant General Manager and continued in that position until his recent change.



—Mr. William Giddings Curtis died the 15th of this month at Highland Springs, Col., of Bright's disease, in the 51st year of his age. Mr. Curtis was Engineer of Maintenance of Way of the Southern Pacific Company, Pacific System. He was Second Vice-President of the American Railway Engineering and Maintenance of Way Association and a member of the American Society of Civil Engineers, in which body he served a term as Director, beginning 1890. Mr. Curtis was born Aug. 19, 1849, at Bridgeport, Conn., and began railroad work when he was 16 years old. For five years he was in the engineering department of the Central Pacific, then for two years as Resident Engineer on Construction of the San Joaquin Valley Railroad, then for nine years Assistant Superintendent and Division Superintendent of roads operated by the Central Pacific, and from 1882 until his death in charge of track and structures, under various titles, for the Central Pacific and the Southern Pacific. In 1890 he took the title which he held at the time of his death, and for some time he was also Assistant to the General Manager. The death of Mr. Curtis is really a serious loss to his profession. He was a man of zeal, fidelity and ability, and deeply interested in his work. With these qualities he has made a permanent mark on that special branch of engineering which deals particularly with the building and maintenance of railroad track. Our readers are familiar with his important work carried on systematically for years in the preservation of ties, and in other particulars he stood in the front rank among maintenance of way men, and he had won a strong place for himself in the general profession of civil engineering.

ELECTIONS AND APPOINTMENTS.

Baltimore & Delaware Bay (Pennsylvania).—The new directors of this company, whose property was recently transferred to the Pennsylvania, are: H. F. Kenney, President; J. C. Rogers, Secretary and Treasurer; Samuel Rea, D. S. Newhall, F. D. Howell, T. Ashton, M. Vandiver and C. T. Westcott. (See R. R. News column.)

Baltimore & Ohio.—W. H. Evans, General Foreman at Columbus, O., has been transferred to South Chicago, Ill., as General Foreman, and M. Elsner becomes General Foreman at Columbus, O.

Butte, Anaconda & Pacific.—M. S. Dean, heretofore Purchasing Agent of the Ohio River, has been elected Vice-President and General Manager, with headquarters at Anaconda, Mont.

Chesapeake & Western.—At the annual meeting of the stockholders, held June 12, the number of Directors was reduced from 12 to 5, and the following were elected: Dewit Smith, W. H. Hall, G. U. G. Holman, J. C. Ward, and G. A. Bennett.

Chicago Terminal Transfer.—W. B. Mallette, Purchasing Agent, has resigned to go with the American Washer & Manufacturing Co., as Engineer and Assistant to General Manager, with headquarters at Chicago, Ill.

Clinton, Dubuque & Northwestern.—The officers of this company, referred to in the Construction column, are: President, H. W. Seaman, Clinton, Ia.; Vice-President, Charles G. Gates, Chicago, Ill.; Secretary and Treasurer, E. W. Boynton, Davenport, Ia.

Delaware, Lackawanna & Western.—John H. Crawford has been appointed General Eastern Freight Agent, with headquarters in New York, succeeding W. A. Fleming, who is to be in charge of the commercial interests of this company in Brooklyn, N. Y.

Florence & Cripple Creek.—J. M. McCarthy has been appointed Purchasing Agent.

Florida Central & Peninsular.—T. A. Phillips, Assistant General Manager, has resigned on account of ill health and the position has been abolished.

Great Northern.—A. E. Taber has been appointed Master Mechanic, with headquarters at Kalispell, Mont.

Indiana, Illinois & Iowa.—F. H. Mudge has been appointed Chief Engineer, with headquarters at Kankakee, Ill.

Minnesota Transfer.—E. Pennington, General Manager of the Minneapolis, St. Paul & Sault Ste. Marie, was, on June 13, elected President of the M. T.

Missouri Pacific.—W. D. Lowery has been appointed General Foreman of the car department, with headquarters at St. Louis, Mo., succeeding Thomas Eubank, resigned.

Norfolk & Western.—John P. Green, James McCrea and Samuel Rea have been elected Directors, succeeding Henry Whelen, Jr.; W. B. Campbell and W. B. Boulton resigned.

Northern Pacific.—M. C. Kimberly, General Superintendent, having been granted a leave of absence, A. E. Law becomes Acting General Superintendent. Mr. Law is succeeded as Division Superintendent at Minneapolis, Minn., by E. C. Blanchard, who in turn is succeeded by E. L. Brown, heretofore Superintendent of the St. Paul & Duluth, as Division Superintendent at Duluth, Minn.

Ohio River.—F. E. Blaser has been appointed Purchasing Agent, with headquarters at Parkersburg, W. Va., succeeding M. S. Dean, resigned.

Pittsburgh, Johnstown, Ebensburg & Eastern.—S. M. Brophy has been appointed Superintendent, with headquarters at Juniata, succeeding J. O. Reed, effective June 15.

St. Joseph & Grand Island.—G. D. Berry, Purchasing Agent at St. Joseph, Mo., has resigned.

St Louis & San Francisco.—A. J. Davidson, heretofore Superintendent of Transportation, has been appointed General Superintendent, with headquarters at St. Louis, Mo. The position of Superintendent of Transportation has been abolished, effective June 12.

St. Louis, Kansas City & Colorado.—W. M. Mitchell, General Superintendent at St. Louis, Mo., has resigned.

Seaboard Air Line.—J. C. Reed has been appointed Master Mechanic, with headquarters at Portsmouth, Va., succeeding C. B. Royal.

Sioux Falls & Northwestern.—The officers of this company, referred to in the Construction column, are: President, John W. Tuthill; Vice-President, P. F. Sherman; Treasurer, D. L. McKinney; Secretary, Geo. Schlosser, all of Sioux Falls, S. D.

Southern Pacific.—At a meeting of the stockholders, held June 14, H. E. Huntington was elected First Vice-President, succeeding Thos. H. Hubbard, resigned. Mr. Huntington is succeeded as Second Vice-President by C. H. Tweed.

Union Pacific.—C. A. Boies has been appointed Assistant Division Superintendent at Laramie, Wyo., succeeding J. W. Hay, resigned.

Warren & Corsicana Pacific.—The officers of this company, referred to in the Construction column, are: President, J. I. Campbell; Treasurer and General Manager, I. L. Campbell; Secretary, Y. W. McNeil, all of Houston, Tex.; General Superintendent, J. N. Johnston; Traffic Manager and Assistant Superintendent, A. T. Wansbrough, Warren, Tex.

Weatherford, Mineral Wells & Northwestern.—At the annual meeting of the stockholders, held June 12, at Weatherford, Tex., P. E. Bock was elected Vice-President and J. W. Boot Secretary and Treasurer.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA ROADS.—C. D. Smith & Co., of Birmingham, Ala., have the contract for eight miles of road for the Sample Lumber Co., of Hollins, to run northwest from Edion.

BATON ROUGE, HAMMOND & EASTERN.—This company was incorporated in Louisiana, June 7, with a capital stock of $150,000, to build a railroad from Baton Rouge east about 45 miles to Hammond. It is understood that arrangements are being made for building at once. W. R. Watson is President, and Dr. A. F. Gates, Vice-President. The headquarters are to be at Amite, La.

Canadian Pacific.—A connection is to be built at Guelph, Ont., with the Guelph Electric Street Ry.

Carnegie Connecting.—This company was incorporated in Pennsylvania June 9, with a capital stock of $20,000, to build a line two miles long in Allegheny County.

Chattahoochee & Gulf.—See Railroad-News column.

Chicago & Grand Trunk.—C. M. Hays, General Manager, has returned from Great Britain and announces satisfactory arrangements made for completing the reorganization of the company and providing funds for reducing grades and double tracking the line between Port Huron, Mich., and Chicago.

Chicago, Burlington & Quincy.—J. H. McShane & Co., of Omaha, Neb., have the contract for building the first 15 miles, and C. H. Sharp, of Lincoln, Neb., for the second 15 miles on the extension from Tolúca, Mont., southwest 110 miles to Cody, Wyo. (April 6, p. 227.)

Cincinnati & Licking River.—The company announces that it is about to make contracts for building the connecting line of 28 miles from Brooksville, Ky., to Johnson Junction, to connect the Brooksville R. R. with the Covington, Flemingsburg & Ashland. The company also expects to build 20 miles more this season from Hillsboro, Ky., south to Morehead. When completed it will have about 75 miles of line. S. S. Puckett, of Yellow Springs, O., is President. (June 1, p. 364.)

Clinton, Dubuque & Northwestern.—Preliminary surveys are in progress for this line of the Davenport, Rock Island & Northwestern from Clinton, Ia., northwest about 54 miles, via Maquoketa to Dubuque. The officers are given under Elections and Appointments. (July 8, p. 380.)

Dakota, Nebraska & Southern.—The route of this proposed line is from Grand Island, Neb., north via Palmer, Spaulding, Bartlett, Amelia, Atkinson, Perry and Butte, Neb., Fairfax, Bonesteel, Pierre and Faulkton, S. D., to Aberdeen, with branches to Cedar Rapids, Ericson, O'Neill and Spencer, Neb., and other ports. Surveys are completed for 374 miles, and engineers are in the field. Preparations are being made to have votes taken on subsidies along the line surveyed. There will be about 200 miles of grading to be begun soon. The line will pass over a rough country but will require no tunneling. The maximum grade is 1 per cent., and the maximum curves 3 per cent. There will be four important bridges crossing Loup, Niobrara, White and Aberroni Rivers. The organization of the company is not fully perfected. The road is being built by the Manhattan Promoting Co., 104 Bee Building, Omaha, Neb. The officers of the Promoting Co. are: President, B. E. Sturdevant, Atkinson, Neb.; Vice-President, Jacob E. Hines, Omaha; Secretary, John T. Daily, Omaha; Treasurer and General Manager, Jonas H. Johnson, Chicago; General Counsel, James M. Kerr, Omaha; Engineers in Charge, Wilbur H. Beon, at Jefferson, Ia., on the section from Cedar Rapids to Perry, 120¼ miles (June 8, p. 380) and Geo. S. Oliver, Banester, Col., on the remaining section. (Official.)

Dakota Pacific.—Wm. T. Coad, of Rapid City, S. D., President of this company, has been in St. Paul, seeking aid to complete his line which now runs from Rapid City west 32 miles to Mystic. It is projected across the Sioux Reservation and thence to Huron on the Great Northern. (Sept. 29, 1899, p. 685.)

Des Moines Union.—The company is preparing to add a large number of tracks to its yards in the western part of Des Moines, Ia. A strip of land from West Eleventh to West Seventeenth streets, between the present tracks and the Rock Island tracks, is being filled in and five more tracks will be added as soon as the grading is completed.

Eureka & Klamath River.—Grading is to be resumed at once, according to report, on the extension from Eureka, Cal., to Arcata, 7½ miles. Most of the grading was done last year. (April 14, 1899, p. 241.)

Great Northern.—The company is about to build a line to Phoenix, B. C., to connect with the Greenwood & Phoenix Tramway Co.'s line from Greenwood.

Gulf, Beaumont & Kansas City.—Grading is reported begun between Rogan, Tex., and Jasper, on the extension from Rogan, north about 65 miles to San Augustine. (April 13, p. 245.)

Gurdon & Fort Smith.—This company was incorporated in Arkansas, June 11, with a capital stock of $300,000, to build a railroad from Gurdon, on the Missouri Pacific, to run northwest about 25 miles to Shawmut. The directors are: William Grayson, N. W. McLeod, W. E. Grayson, St. Louis; George H. Grayson, Arkadelphia; Thomas Gage, Gurdon.

Illinois Central.—Work is reported in progress on the connecting line from Phalia, Miss., on the Rosedale & Mississippi Central Valley Line, to run southeast about 10 miles to Lake Kimble, to connect with the Boyle Branch. (Aug. 18, 1899, p. 689.)

The St. Clair Construction Co., of Kankakee, Ill., has the contract for building 20 miles of double track between Odin and Irvington, Ill. (June 15, p. 407.)

Jonesboro, Lake City & Eastern.—Work is begun on the extension from Leachville, Ark., east to Blythesville.

Kansas City, Mexico & Orient.—Surveys are being made and right of way secured, according to report, for the Texas and Mexico sections of this line from Kansas City, Mo., southwest through Oklahoma, Texas and Mexico to Topolobampo, Mex., on the Gulf, of California. Work will be resumed in July near Sweetwater, Tex., in which State the road is to be known as the Panhandle & Gulf. The Chihuahua & Pacific forms part of the Mexican line, and work is to be begun about the same time for its extension. (April 20, p. 263.)

Marion & Rye Valley.—This line which extends from Marion, Va., to Currin Valley, 6½ miles, is to be extended about 10 miles more, according to report.

Mississippi Roads.—The road connecting two lines of the Illinois Central, referred to last week (p. 380), is proposed from Redwood, 12 miles north of Vicksburg, on the Illinois Central, northeast about 28 miles along the Yazoo Valley to Valley, on the Yazoo Branch of the Illinois Central, seven miles south of Yazoo City. The line will pass through fine cotton plantations and heavily timbered lands. The people along the line are urging the Illinois Central to build the road. W. W. Coody, of Phoenix, Miss., is interested.

Mobile, Jackson & Kansas City.—C. D. Smith & Co., of Birmingham, Ala., have taken the contract for five miles of the proposed extension of this line. (July 28, 1899, p. 547.)

New York Central & Hudson River.—Surveys are authorized, according to report, for the elimination of grade crossings and other improvements at Utica, N. Y.

Pennsylvania.—On account of the difficulties of raising the track through New Brunswick, N. J., it is stated that the company has decided to abandon track elevation and to build a four-track cut-off to one side of the city. The reported route will cross the Raritan River two miles south of the present bridge at New Brunswick, joining the main line at Deans. The Millstone Branch will then be utilized for local traffic between New Brunswick and New York. (Feb. 16, p. 116.)

Pennsylvania Roads.—Mr. M. R. Shaffner, of McConnellsburg, Pa., is Secretary of the company which proposes to build a road from that city to Cherry Run, W. Va., 30 miles. The line would pass through mineral and timber lands. People along the line have offered $25,000 to complete the road. (Official.)

Surveys are reported completed for the cut-off from Turtle Creek and Murrysville, Pa., to run north about 15 miles to New Kensington. (May 18, p. 330.)

The Midland Coal Co. is reported building a railroad from Houstonville to new coal mines on Plum Run.

Surveys are in progress for elevating the road through Chester, Pa.

Philadelphia & Reading.—An officer confirms the statement as to the proposed spur of the Port Reading Line. It is to extend south 7,800 ft. to the clay pits at Woodbridge, N. J. Kearns & Egan, 3343 North Sixteenth street, Philadelphia, and Joseph Ryan, of Woodbridge, N. J., have the contract for grading. The track will be laid by the railroad company. (June 15, p. 408.)

Princeton & Northwestern.—This company has been incorporated by the Chicago & Northwestern to build a line from Princeton, Wis., northwest about 100 miles to connect with the Chicago, St. Paul, Minneapolis & Omaha Line at Marshfield.

Rochester & St. Clair.—Right of way has been obtained and building is to be begun on this line from Rochester, Mich., on the Michigan Central, to run east 18 miles to Lenox, on another branch of the M. C. Justin R. Whiting, of St. Clair, is President. (Feb. 16, p. 112.)

Rockford, Beloit & Zanesville.—This company has been incorporated in Illinois, with a capital of $200,000, to build a railroad from Rockford north about 20 miles to the Wisconsin line and thence to Beloit, Wis. The principal office is Rockford. The incorporators are: Howard M. Carter, Evanston, Ill.; Sidney W. Worthy, Arthur Dyrenforth, Will H. Clark and Hiram I. Keek, all of Chicago.

Santa Fe, Prescott & Phoenix.—Plans are under consideration, according to report, for building several branches to mines.

Sabine Pass & Northwestern.—Surveys are completed and contracts reported let for this line from Sabine Pass, Tex., northwest about 300 miles via Palestine, Athens and Greenville to Bonham. The work is to be begun about July 15. W. H. Booker, of Bonham, Tex., is President and General Manager. (March 17, 1899, p. 198.)

Sioux Falls & Northwestern.—Organization of this company was effected at Sioux Falls, S. D., June 12. It was decided to begin to secure right of way at once. The road is projected from Sioux Falls southwest about 175 miles via Madison and Brookings to Aberdeen. (June 15, p. 405.)

Southern Pacific.—Grading is begun on a double track road at Galveston, Tex., for the Galveston, Houston & Northern, from the island end of the bay bridge to the S. P. wharves, about three miles. (June 8, p. 380.)

Preparations are reported being made to begin building at once on the spur in Kern County, Cal., near Bakersfield, to run south eight miles to the Sunset oil wells. (Dec. 29, 1899, p. 902.)

An officer writes that the changes proposed in the freight yards at Ashland, Ore., are very slight. (May 18, p. 330.)

Southern.—W. J. Oliver & Co., of Aiken, Ala., have the contract for the 20 miles of the Ensley Southern from Parrish, on the Northern Alabama, southeast 36 miles, to Ensley. The first 10 miles was let to Redman & Donovan, of Chautauqua, Tenn. (June 1, p. 364.)

Sumpter Valley.—The Utah Construction Co., of Ogden, Utah, is reported to have the contract for the extension from Sumpter, Ore., south 20 miles to Clifford. David Eccles, of Ogden, is President and General Manager. (April 20, p. 264.)

Tennessee Northern.—The company does not intend at present to extend its road to Jellico, Tenn., but is making some extensions for industrial purposes. These will aggregate about six miles and will include a line from the company's new blast furnace to various mines. There will also be an extension from the extreme northern station at Rex in the direction of Jellico, and eventually the line will be extended to that point. (May 25, p. 348.) J. L. Stamps, of Knoxville, has the contract. (Official.)

Texas Central.—Locating surveys are reported being made for the extension from the main line north to Thurber, Tex. Two different lines have been surveyed. (April 6, p. 228.)

Texas Roads.—The Lake Jackson Plantation Co. is reported about to build a standard gage line 10 miles long to connect this property with the Velasco Terminal.

Virginia & Southwestern.—No definite plans have been made as to the branch from Elkanah, Tenn., to quarries, about 1¾ miles. (June 8, p. 380.) Negotiations are pending. (Official.)

Welch's Mill & Centerville.—The people of Marion, Ala., are endeavoring to have this road, which runs from Riderville, northwest about 17 miles, to Pinetucky, extended on to their city.

Warren & Corsicana Pacific.—The section from Warren, Tex., to Campwood, 18 miles, is reported completed and open for traffic. The line is projected from Warren northwest about 150 miles to Corsicana. The officers are given under Elections and Appointments. (Dec. 8, 1899, p. 854.)

Washington, Westminster & Gettysburg.—The company expects to close contracts for building this line by July 1. All details have been agreed upon. The road is projected from Rockville, Md., north 78 miles to Gettysburg, Pa. (April 14, 1899, p. 272.) James B. Colegrove, of Washington, D. C., is President. (Official.)

Water Valley & Helena.—This company has been organized to build a railroad from Water Valley, Miss., on the Illinois Central, to run northwest about 70 miles, via Riverside, to a point on the Mississippi, opposite Helena, Ark. A committee of Water Valley people has been appointed, headed by W. C. Bryant.

Wisconsin Roads.—A company is being organized to build a railroad from Gilmanton, to run north about 30 miles, via Eleva, on the Chicago & Northwestern, to Eau Claire, on the Chicago, Milwaukee & St. Paul.

GENERAL RAILROAD NEWS.

Baltimore & Delaware Bay.—At the annual meeting of the stockholders, on June 16, the property of this company was transferred to the Pennsylvania. The line runs from Chestertown, Md., to the Delaware State line, 24 miles, with a branch from Worten Junction to Nicholson, 3.72 miles. The company also owns the Smyra & Delaware Bay R. R. from the Maryland State line to Bombay Hook, 17.31 miles, making a total mileage operated of 45.03.

Baltimore & Lehigh.—The mortgage of $85,000 to the Mercantile Trust & Deposit Co. has been paid and released.

Chattahoochee & Gulf.—The Central of Georgia has entered into an agreement with this company to rent its line now building from Columbia, Ala., southwest about 68 miles, via Dothan, to the Pea River. Nearly the entire line is graded. The securities consist of $200,000 stock and about $300,000 bonds. The rental is equal to 6 per cent. on the stock and bonds, of which 5 per cent. is to be used for dividends and 1 per cent. as a sinking fund to retire the bonds. After the bonds are retired, the C. of G. will pay an annual rental of 5 per cent. dividend on the stock. The C. of G. will furnish the equipment and guarantees to keep the property in first-class condition and repair. Beyond the leasing, the C. of G. has no financial interest in the company. (Railroad Construction column, Nov. 17, 1899, p. 800.)

Chesapeake Beach.—Ambrose C. Dunn has made another application for a receiver for the property of this company and the Chesapeake Bay Construction Co. He also files a bill of complaint in the United States Circuit Court at Baltimore, Md., to restrain Otto Mears and Chas. Popper from voting or disposing of the stock of the construction company or the stock or bonds of the railroad company. Mr. Dunn's former application for a receiver was denied by Judge Bradley last year. (July 28, 1899, p. 548.)

Chesapeake & Ohio.—The New York Stock Exchange has listed $1,250,000 additional general mortgage 4½ per cent. gold bonds of 1992. These are part of an issue of $1,500,000 sold for delivery Sept. 1, the proceeds of which are to be used for the purchase of the Ohio River & Charleston, of Kentucky, and for making improvements at Newport News and through Richmond, Va. (May 11, p. 312.)

Chicago, Burlington & Quincy.—Holders of Burlington & Missouri River in Nebraska 6 per cent. bonds of July 1, 1918, are notified that 129 of these bonds for $1,000 each, and 26 for $600 each, have been drawn for July 1, with accrued interest, at the New England Trust Co., Boston. (Dec. 15, 1899, p. 872.) At the same time and place have been drawn for payment 16 bonds for $1,000 each, and seven bonds for $700 each of the Republican Valley 6 per cents., due July 1, 1919.

Cleveland, Akron & Columbus.—The stockholders, on July 13, will vote on making a mortgage for $4,000,000. (June 15, p. 408.)

Erie.—The Suspension Bridge & Erie Junction first mortgage 7 per cent. bonds, maturing July 1, are called for payment at the company's office, New York, July 2.

Fonda, Johnstown & Gloversville.—The first mortgage 7 per cent. bonds, due July 1, will be paid July 2 at the office of the New York Security & Trust Co., 46 Wall St., New York. (June 1, p. 364.)

Gulf & Interstate.—Application was made in the District Court at Galveston, Tex., on June 16, for a receiver for this line which runs from Beaumont, Tex., to Port Bolivar, 70.35 miles. (April 6, p. 228.)

Kansas City & Northern Connecting.—A bondholders' committee, consisting of Hermann Kuhn, Wm. M. Ivins, Thomas L. Chadbourne, Jr., and Herbert C. Wright, calls on holders of first mortgage bonds to deposit the same with the Provident Life & Trust Co., Philadelphia, under an agreement. Application is made for an issue of $125,000 receivers' certificates. (April 6, p. 228.)

Nashville & Decatur.—The first mortgage 7 per cent. bonds, due July 1, 1900, will be paid at par at the office of the Louisville & Nashville on and after July 2. (Oct. 27, 1899, p. 754.)

Philadelphia, Reading & New England.—Sheriff Smith, at Poughkeepsie, N. Y., on June 9, upon judgment obtained by the Guarantee Trust & Safe Deposit Co., of Philadelphia, as trustee, levied upon $156,400 stock of the Dutchess County R. R., and $48,700 of the Poughkeepsie Bridge Co. This is with a view to perfecting the title of the Central New England to securities formerly owned by the P., R. & N. E., its predecessor company. (July 14, 1899, p. 516.)

Quebec Central.—At the annual meeting President Edward Dent made the following statement with reference to refunding by the company:

> The powers conferred by the Act of 1898 enabled the holders of prior lien bonds to exchange their securities for new 4 per cent. debenture stock, and up to the present this offer has been accepted by the holders of £195,500 out of a total issue of £350,000 bonds. The directors hope shortly to issue a circular to the holders of the income bonds setting forth a proposal for the subdivision of their bonds into two classes of security; the offer will probably be for each £100 of existing bonds to receive 50 per cent. of a new 3 per cent. debenture stock or bond and 50 per cent. of a new income bond, which would be entitled to interest up to the rate of 7 per cent. if earned in any one year, so that the combined interest on the new securities would be equivalent to the interest on the existing 5 per cent. income bonds. (Sept. 29, 1899, p. 686.)

San Francisco & Northern Pacific.—Holders of first mortgage bonds are notified that proposals are asked on July 9, by the Mercantile Trust Co., New York, for the sale of these bonds at not to exceed 110 and interest to consume $25,032.46. (July 21, 1899, p. 532.)

St. Paul & Duluth.—Circulars announce the taking over of this property on June 18 by the Northern Pacific. (June 15, p. 408.)

Washington & Potomac.—The sale of this propery is set for July 18. (June 8, p. 380.)